WATER WORKS & SEWERAGE

A GILLETTE ABP ABC PUBLICATION

Volume 86, No. 1 JANUARY, 1939 L. H. Enslow EDITOR

Here's PITTSBURGH LIMO ACCURACY

Not this

The following standard specifications cover the accuracy requirements of the American and New England Water Works Associations for ⅝" cold water meters. Any conventional disc meter will meet them.

Allowable range (spread), 1 to 20 g. p. m., 4%

Minimum Test Flow, ¼ g. p. m., 90%

Or this

SPECIFICATIONS FOR BETTER QUALITY DISC METERS:

Allowable range (spread), 1 to 20 g.p.m., 2.2%

Low Flow Test, ¼ g. p. m., 95%

Minimum Test Flow, ⅛ g. p. m., 90%

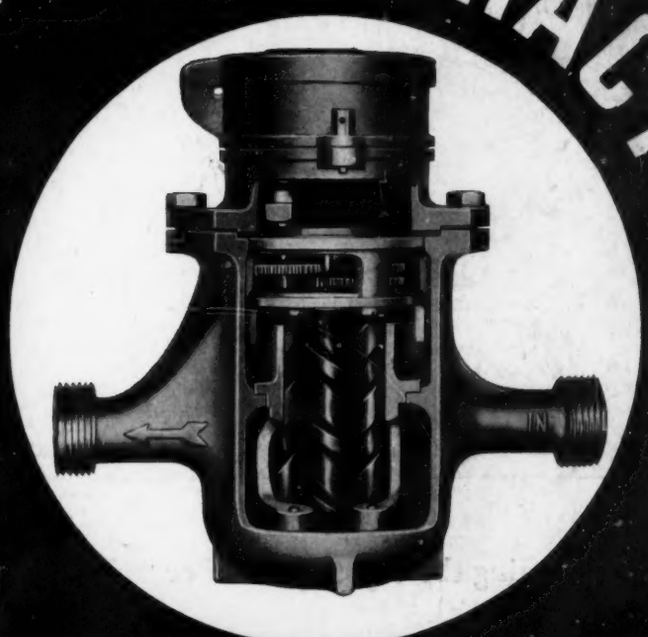
But this

STANDARD SPECIFICATIONS FOR PITTSBURGH IMO METERS:

Allowable range (spread), 1 to 20 g.p.m., 1.2%

Low Flow Test, ¼ g. p. m., 98%

Minimum Test Flow, 1/12 g. p. m., 90%



PITTSBURGH EQUITABLE METER COMPANY
MERCO NORDSTROM VALVE CO.
NEW YORK · BUFFALO · PHILADELPHIA · KANSAS CITY · TULSA · LOS ANGELES · DES MOINES · CHICAGO · COLUMBUS · MEMPHIS · OAKLAND · HOUSTON
Main Offices - PITTSBURGH, PA.

Lithographed on stone by James E. Allen for U. S. Pipe & Foundry Co. Copyright 1939, U. S. Pipe & Foundry Co.

Beginning the eighth year of cumulative evidence that Super-de Lavaud Cast Iron Pipe, produced by a revolutionary method whereby gray iron is *centrifugally cast in a metal mold without chill,* has extraordinary toughness, ductility and resistance to impact.

U.S.
cast iron
PIPE

United States Pipe & Foundry Co., Burlington, N. J.

Plants and Sales Offices throughout the United States.

● This 6'6" x 14'6" panel operates 23 motors ranging from ½ H.P. to 2 H.P. in a Mid West Sewage Treatment Plant. All motors are operated and protected by "3C" Bulletin 6013 Across-the-Line Starters with fused Main Line Knife Switch Protection.

Waste gas is used to operate a gas motor driven generator. All motors have transfer equipment so set that if the motor generator supply fails, the motors automatically transfer to Power Company supply. Restoration of Generator supply automatically restores motors to that service.

Aerator motors are equipped with automatic Electric Driven Motor Timer, so operation of Aerators can be supervised.

Indicating Watthour Meters are supplied for totalizing the power consumption regardless of power source.

This installation is typical in neatness, simplicity and efficiency of hundreds of "3C" Sewage Disposal and Water Works plant controls.

Our nearest office is at your service for Auxiliary Electric Controls.

THE CLARK CONTROLLER CO.
1146 EAST 152nd STREET · CLEVELAND, OHIO

AKRON · BALTIMORE · BIRMINGHAM · BOSTON · BUFFALO · CHICAGO
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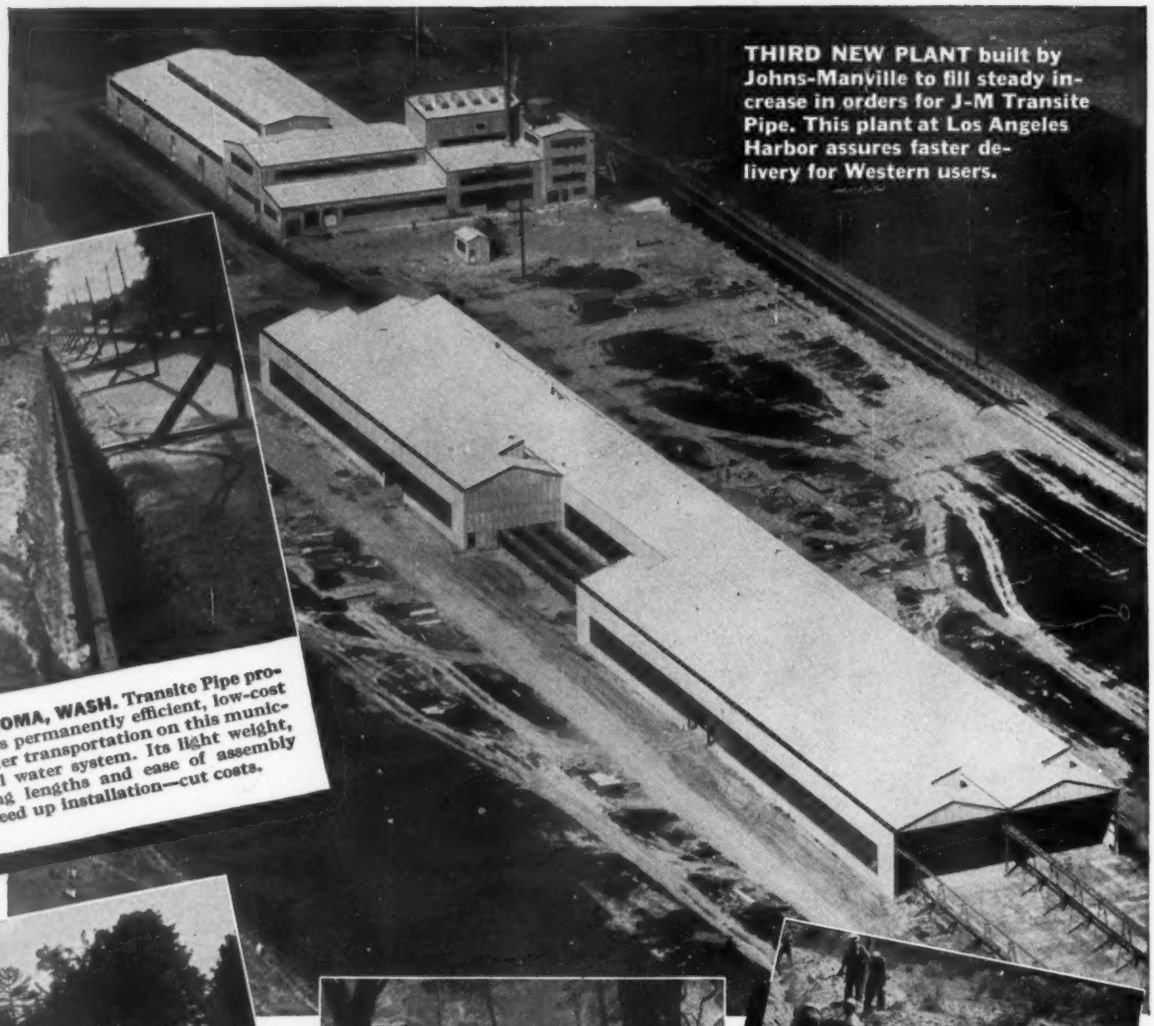
NOW—A THIRD NEW

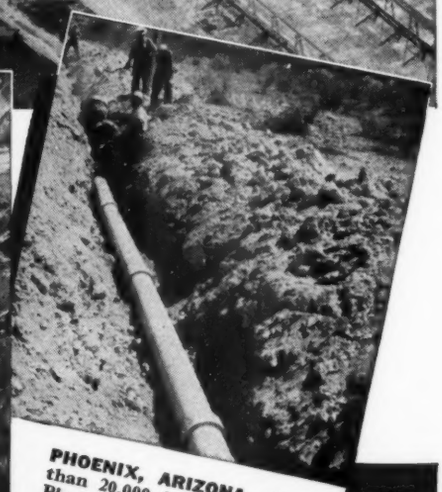


THIRD NEW PLANT built by Johns-Manville to fill steady increase in orders for J-M Transite Pipe. This plant at Los Angeles Harbor assures faster delivery for Western users.

TACOMA, WASH. Transite Pipe provides permanently efficient, low-cost water transportation on this municipal water system. Its light weight, long lengths and ease of assembly speed up installation—cut costs.

SEATTLE, WASH. Transite's flexible Simplex Couplings assure absolutely bottle-tight joints. Easily assembled by unskilled workmen, they require no large bell holes—permit the use of narrow, economical trenches.

SAN FRANCISCO, CALIF. In this Golden Gate Park sewer line, Transite's smooth interior provides unusually high carrying capacity, n-.009 for average slopes. Tight joints minimize infiltration—cut sewage disposal costs.

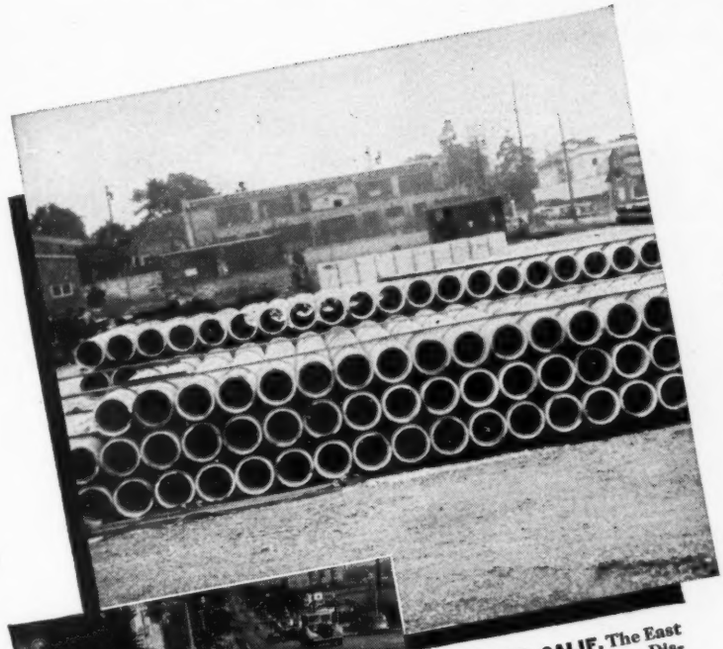


PHOENIX, ARIZONA. More than 20,000 feet of Transite Pipe was used on this installation. Because Transite is non-metallic, it cannot tuberculate. Result: continued high delivery capacity . . . permanently low pumping costs.

TRANSITE PIPE PLANT..

at LOS ANGELES HARBOR

to meet the rapidly growing demand for this durable, asbestos-cement pipe . . .



OAKLAND, CALIF. The East Bay Municipal Utility District of Oakland is a large user of Transite Pipe. For convenience in making extensions to their systems, the pipe is stocked at all times in their own pipe yard.

LOS ANGELES, CALIF. Made of asbestos and cement, Transite Pipe is immune to electrolysis, highly corrosion-resistant. In aggressive cinder fills and corrosive soils, it has established an outstanding service record.

IT IS significant that even with two huge plants working at peak production, still another is needed to supply the ever-increasing demand for Transite Pipe! Conclusive proof that men interested in low-cost water and sewerage systems appreciate its many outstanding advantages—economy of installation—virtual freedom from maintenance—permanently low operating costs.

Made of asbestos and cement, Transite Pipe is strong, durable and highly resistant to all forms of corrosion. Its smooth interior surface cannot rust or tuberculate—carrying capacity stays high, C=140 or n=.009 for average slopes. In water systems, this means pumping costs remain permanently low; in sewer systems, smaller pipe or flatter, less expensive grades may be used.

And there are many other advantages as well. The relatively light 13-ft. lengths are quickly, economically installed—even under difficult trench conditions. Tight, easily assembled couplings eliminate joint leakage in water systems; minimize infiltration in sewer lines. Wherever used, in water and sewerage systems throughout the country, Transite Pipe provides highly efficient service throughout years of practically maintenance-free service.

Why not get all the facts on this asbestos-cement pipe? Write for the free new brochures on Transite Water Pipe (TR-11A) and Transite Sewer Pipe (TR-21A). Address Johns-Manville, 22 East 40th Street, New York City.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE PIPE

AN ASBESTOS PRODUCT

For permanently low-cost water transportation—For efficient, economical sewage disposal

The LEBANON WATER WORKS USES HTH FOR STERILIZING

1
NEW PIPE LINES

● For sterilizing pipe lines, mains, aqueducts, etc., following installation or repair, HTH is a convenient, 70% available chlorine carrier in powder form. Stable, readily soluble and packed in light weight, non-returnable cans and drums, HTH is easily applied on the job without expensive feeding equipment.

2
STORAGE RESERVOIRS

● For periodic or seasonal treatment of reservoirs and tanks to control algae, HTH may be fed with simple hypochlorinating equipment or scattered over the surface of the water as a powder. For sterilizing reservoirs following construction or cleaning, HTH is equally convenient.

3
WATER PLANTS

● For sterilization of new equipment, for general disinfection around the plant, for conditioning filters and as a stand-by source of chlorine for emergencies resulting from power failure, fire, floods, etc., HTH has no equal. One pound of HTH gives 400,000 gallons of water a dosage of 0.2 p.p.m. available chlorine.

The MATHIESON ALKALI WORKS (*Inc.*), 60 East 42nd Street, New York, N. Y.

Soda Ash... Caustic Soda... Bicarbonate of Soda... Liquid Chlorine... Bleaching Powder... HTH and HTH-15... Ammonia, Anhydrous and Aqua... PH-Plus (Fused Alkali)... Sulphur Chloride... CCH (Industrial Hypochlorite)... Dry Ice (Carbon Dioxide Ice)... Analytical Sodium Chlorite.

MEASURES THE WATER OF THE WORLD
BADGER

The efficiency and relative value of all precision instruments are determined by accuracy, durability, dependability, and low maintenance cost. Badger Meters excel in the application of these precision features and assure reliable recording of the smallest stream to the heaviest flow.

There is a size and type of Badger Water Meter for every service from the 5/8" disc to the large 10" compound and 12" turbine.

Write for specific bulletins.

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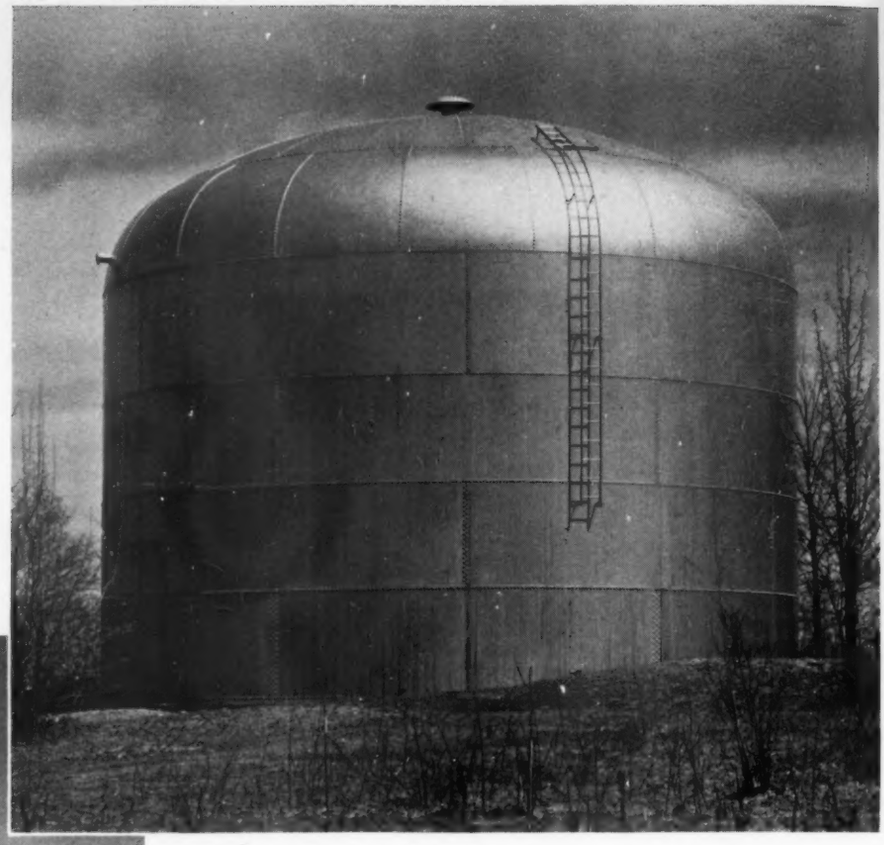
MILWAUKEE, WISCONSIN

Branch Offices: New York City • Tampa, Fla. • Seattle, Wash. • Savannah, Ga. • Kansas City, Mo. • Marshalltown, Iowa • Los Angeles Calif. Chicago, Ill. • Waco, Texas • Philadelphia, Pa.

BADGER *Water* **METERS**

ELLIPSOIDAL ROOFS *prove popular for* STEEL TANKS



A MODERN, attractive structural design for steel water tanks is often an important factor in the selection of storage facilities for municipal waterworks systems. Ellipsoidal roofs have played an important part in improving and modernizing the appearance of many types of steel tanks.

Illustrated on this page are two excellent examples of the way in which ellipsoidal roofs are employed. The flat-bottom tank shown above is in service at Eden, N. Y., and has a capacity of 300,000 gals. Located on a hill overlooking the community, the tank maintains the required pressure in the waterworks system. At the left is a 150,000-gal. Horton elevated tank which utilizes the ellipsoidal design both for the roof and bottom. This attractive tank provides gravity water supply for the town, Grand Island, N. Y.

Our nearest office will be glad to show you additional interesting designs for steel tanks that have been adjudged practical from both a structural and practical standpoint.

CHICAGO BRIDGE & IRON COMPANY

Chicago.....2198 Old Colony Bldg.	Birmingham.....1586 North 50th Street	Philadelphia...1644-1700 Walnut St. Bldg.
New York.....3390-165 Broadway Bldg.	Tulsa.....1646 Hunt Bldg.	Boston.....1548 Consolidated Gas Bldg.
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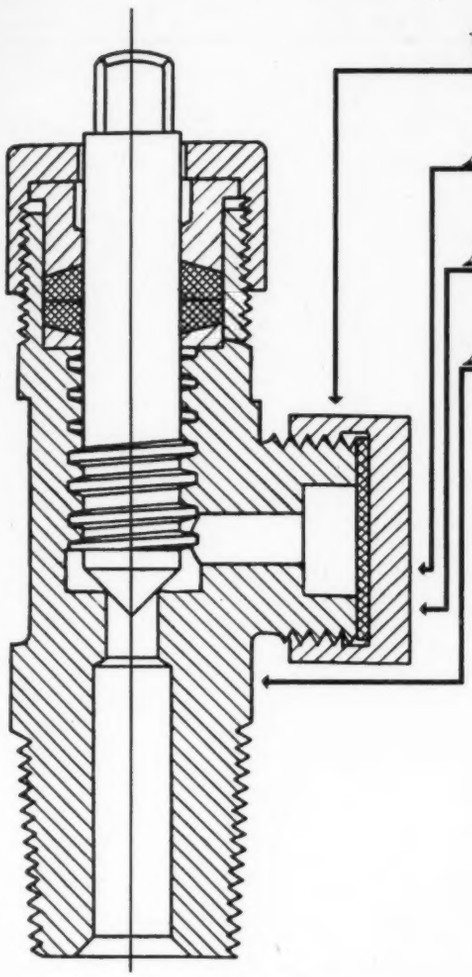
Fabricating plants in CHICAGO, BIRMINGHAM, and GREENVILLE, PA.



Worn valve threads

A pitted valve seat

A drop of oil

A piece of scale from cylinder

Such tremendous trifles bring on the headaches that sometimes lead to serious trouble. Alert at every point of production, packing and shipping, COLUMBIA has largely eliminated these hazards to personal or business health by taking out the guesswork. You can *always* rely on the purity of COLUMBIA Liquid Chlorine and the cleanliness of the containers.

COLUMBIA
LIQUID CHLORINE

SODA ASH • CAUSTIC SODA • SODIUM BICARBONATE • • •
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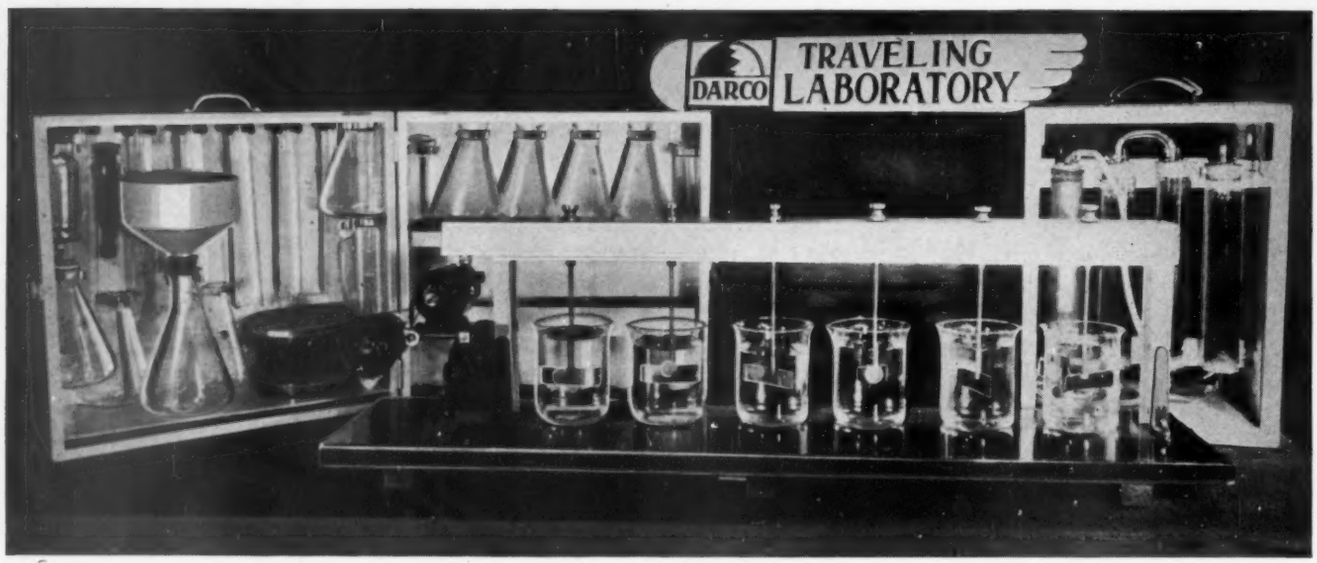
HYDRODARCO

proves its worth in tests that measure performance in use



HYDRODARCO* is tested in field use by means of the Darco Traveling Laboratory. This laboratory contains complete equipment for making Threshold Odor Tests under actual plant conditions. Since the entire apparatus is carried by automobile, demonstrations can be made on the spot. These demonstrations, proving the effectiveness of Hydrodarco* in removing tastes and odors from water, are of unusual interest to all users of activated carbons in waterworks systems.

HYDRODARCO* has proved its worth by actual comparison—in tests which place activated carbon treatment on a measurable basis. Darco pioneered the practical use of these tests in determining carbon performance under actual waterworks conditions.

Base your judgment on the result of these scientific tests — and on the experience of waterworks men throughout the country. When you order activated carbon, specify Hydrodarco*!

Write today for your Darcograph — an extremely practical device which materially simplifies the computations required for correct carbon dosage.

*Reg. U. S. Pat. Off.

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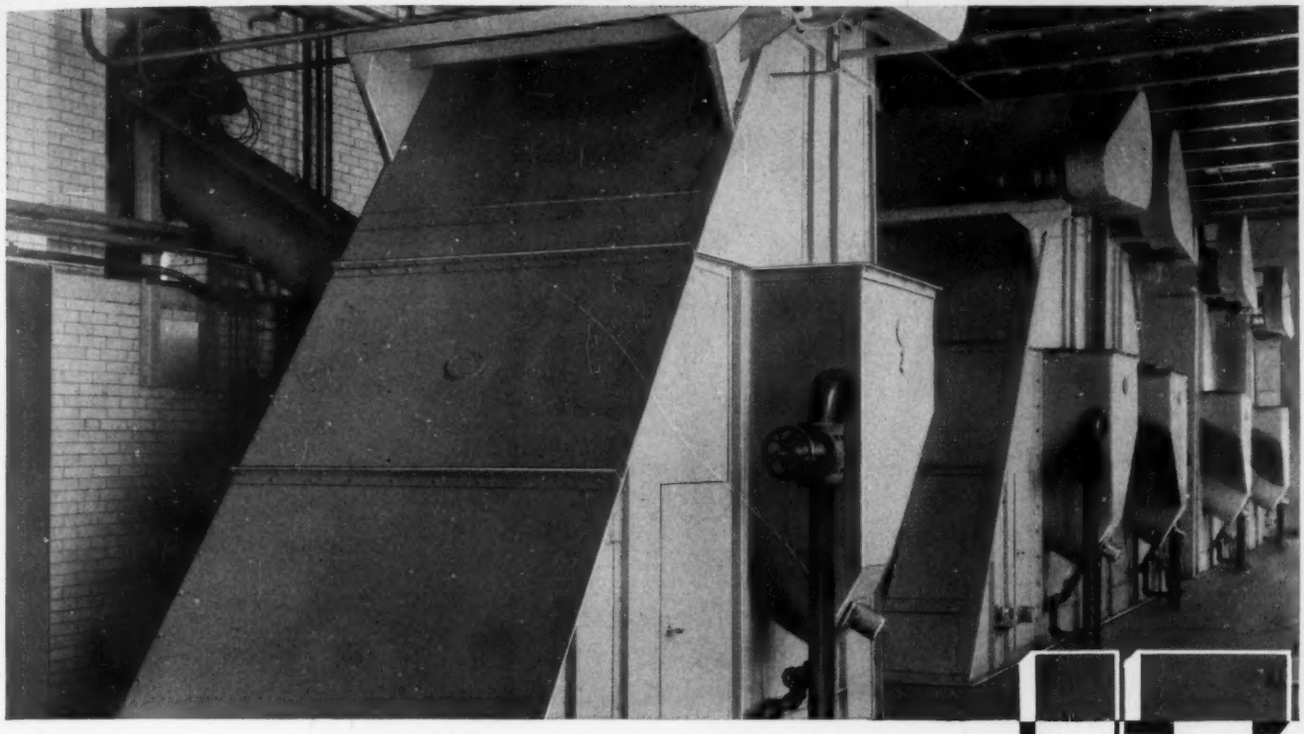
IN BUFFALO'S NEW SEWAGE TREATMENT PLANT



HERE'S HOW THEY HANDLE IF *IT* IS GRIT

● The new sewage treatment plant at Buffalo, New York, one of the largest and most up-to-date plants in the country, is using six Rex grit collectors to gain the benefits of mechanical collection of grit. Six separate Rex Grit Washers, by removing most of the putrescible materials, render the grit suitable for easy disposal.

That Rex grit collectors and washers were the choice for this modern plant is added evidence of their preference among experienced sanitary engineers. Their ability to handle your particular grit collection and washing problem is shown in the performance records of more than a hundred units in plants located throughout the country. Their efficiency, low operating and upkeep costs are recognized by the country's leading consulting engineers and municipalities.

Why not investigate the successful record of Rex grit collectors and washers as well as the complete line of Rex sanitation equipment, which includes Rex Tow-Bro Sludge Collectors, Rex Triturators, Rex Conveyor Sludge Collectors, and Rex Mechanically-Cleaned Bar Screens. For descriptive literature on any of the items in the Rex line, fill in and send the coupon below.

REX SANITATION EQUIPMENT

CHAIN BELT COMPANY of Milwaukee

CHAIN BELT COMPANY
1610 W. Bruce St., Milwaukee, Wis.
Please send me literature on the following:
☐ Rex Grit Collectors and Washers
☐ Rex Tow-Bro Sludge Collectors
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Firm Name .....

By ..... *Title* .....

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City ..... *State* .....

300,000 OPERATIONS

AND STILL IN GOOD WORKING CONDITION

This veteran served five years on a heat recovery line, being partially opened and closed every four minutes seven hours a day for five years—exceptional service even from a valve of exceptional quality. A tribute to the practical applications of Crane research.

"..to unearth new facts"

Recently, the newly completed Crane Research Laboratories, housing the largest and best equipped research facilities in the industry, were opened to public view. In the foreword of a booklet published on this occasion, President Charles B. Nolte says:

"Research is misunderstood by a great many people, but in its simplest form it may be defined as an organized and diligent application of existing knowledge to unearth new facts. . . . Crane Co., therefore, is dedicated to the philosophy that only through continuing a well-organized program of research can it best serve its employees, its stockholders, the users of its products, and society in general."

TRANSLATING RESEARCH INTO DOLLARS FOR YOU

Crane research has as its objective the saving of dollars in your plant operation—the improvement of those valves and fittings whose responsibility it is to control all phases of flow.

Research in design and in new alloys has resulted in multiplying the life of valve stems—this improvement translated into longer life means dollars for you. Valve seats have greater resistance to erosion and corrosion because of research—and again research cuts your costs—saves you money.

Alloys have been developed capable of withstanding the searing cold of 150 degrees below zero—the scorching heat of 1300 degrees above, opening up new fields for you in the handling of liquids or gases at greater ranges in temperature. And in welding new alloys, Crane research has developed new techniques that make their use practical. Again this means increased production—more dollars in profit for you.

But research does not stop with these spectacular achievements . . . it also provides an accurate control of manufacture that guarantees the uniform, high quality of the valves and fittings you buy from Crane.

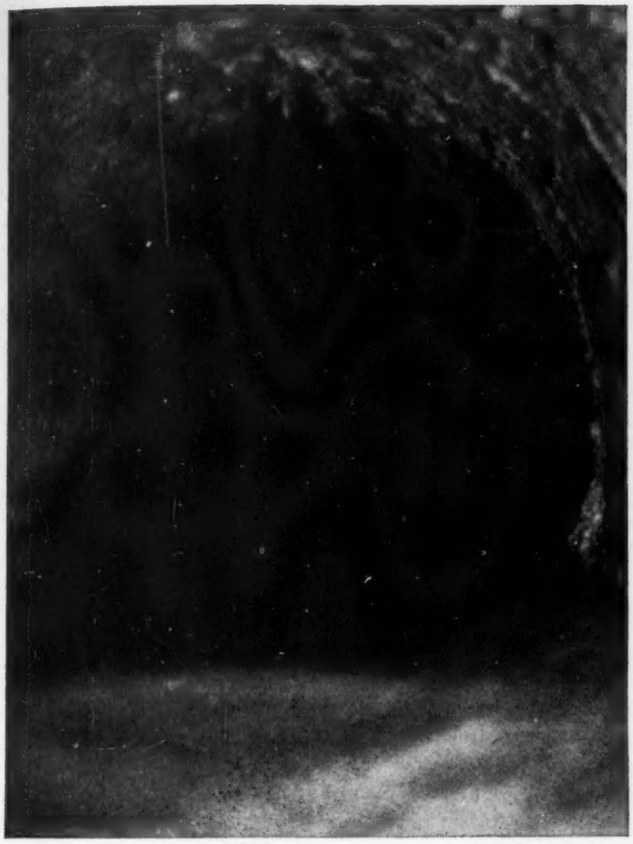
CRANE

CRANE CO., GENERAL OFFICES
836 S. MICHIGAN AVE., CHICAGO

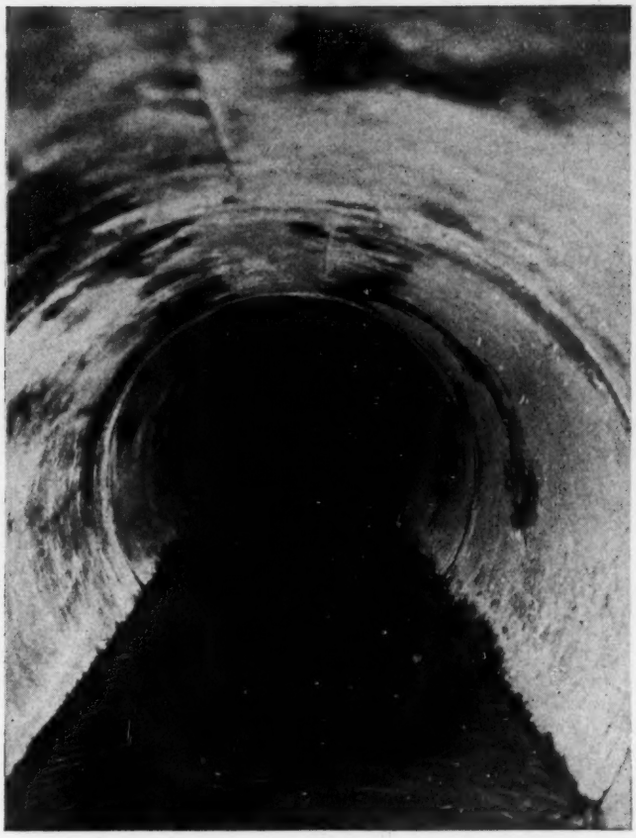
VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS

NATION-WIDE SERVICE THROUGH BRANCHES AND WHOLESALERS IN ALL MARKETS

CEDAR RAPIDS *KNOWS*
concrete pipe is best for sewers



1887 This concrete pipe sanitary sewer has been in continuous service for over half a century. Concrete is still smooth and dense—sewage scum shown on arch.



TODAY Section of the new 48-inch concrete pipe interceptor through soft fill across Cedar Lake. A fine piece of engineering and construction. Infiltration is practically nil.

CEDAR RAPIDS recently completed a program of sanitary sewer and sewerage works construction based upon a definite city plan and zoning laws which anticipate the probable trend and growth of business and home occupancy for a forty-year period.

It is interesting to note that one of the new precast concrete pipe interceptors relieves the load of an old concrete interceptor constructed in 1887. This half-century old sewer carried all of the East Side sewage of the city until a few years ago, and is *still in good condition.*

2,700 feet of the new interceptor is 48-in. pipe placed in deep tunnel under a street occupied by trunk-line railway tracks. The whole project is carefully planned and constructed to resist all probable superloads. Designed by Howard R. Green Co., Cedar Rapids. F. E. Young, City Engineer, joint supervisor of construction.

Portland Cement Association
Dept. A1-29, 33 W. Grand Ave., Chicago, Ill.
Please send free booklets:
☐ "Concrete Pipe Sewers"
☐ "Monolithic Concrete Sewers"
Name .....
Address .....
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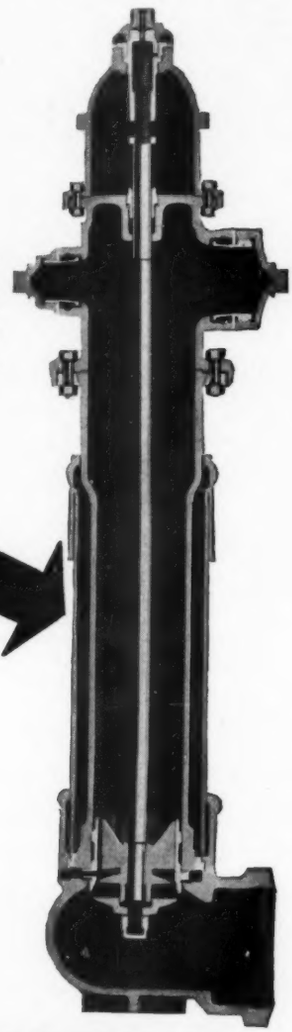
This unique Sliding Protection Case makes

Mathews Hydrants Defy Frost-heave

Here is a construction which saves time, money, and water during any cold winter. For the Mathews "protection case" is designed and installed to absorb all the thrust that frozen ground exerts as it heaves upward. Instead of cracking the castings or breaking the hydrant loose from the main, frost simply lifts the protection case, while the water-carrying parts are left entirely free from strain. No expensive digging, no expensive replacements, no expensive water losses. Sure fire protection right through the coldest winter.

THE PROTECTION CASE rests loosely in the elbow. It provides a protective sleeve which is free to lift with frozen ground, and a permanent opening through which the barrel may be removed.

THE BARREL, containing all operating parts, screws into the elbow to form the complete water-carrying hydrant, yet it can be unscrewed and lifted out through the protection case.



Other advantages of the MATHEWS SLIDING PROTECTION CASE

It lets you "change hydrants" as you'd change a tire.

Therefore: Traffic-smashed hydrants can be repaired without digging.

Emergency repairs can be made in the shop without interrupting fire protection.

60-year-old hydrants can be completely modernized without digging.

Grade changes can be made up or down without digging.

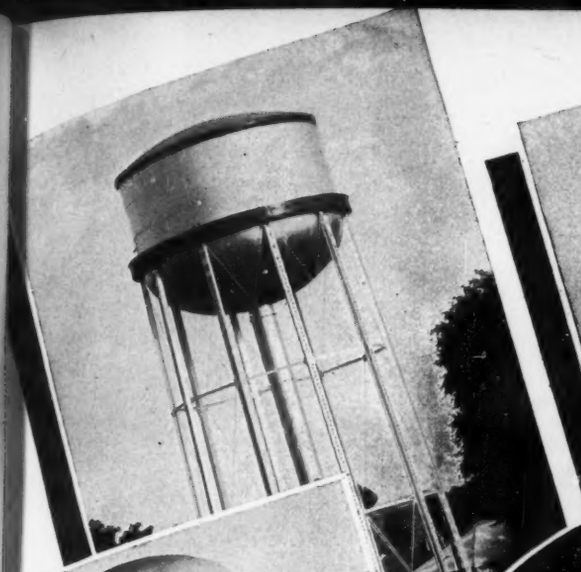
Write for full details.

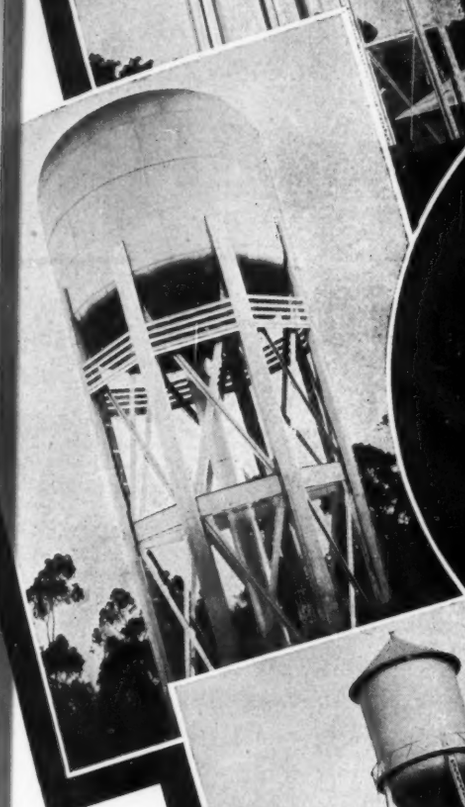
MATHEWS HYDRANTS

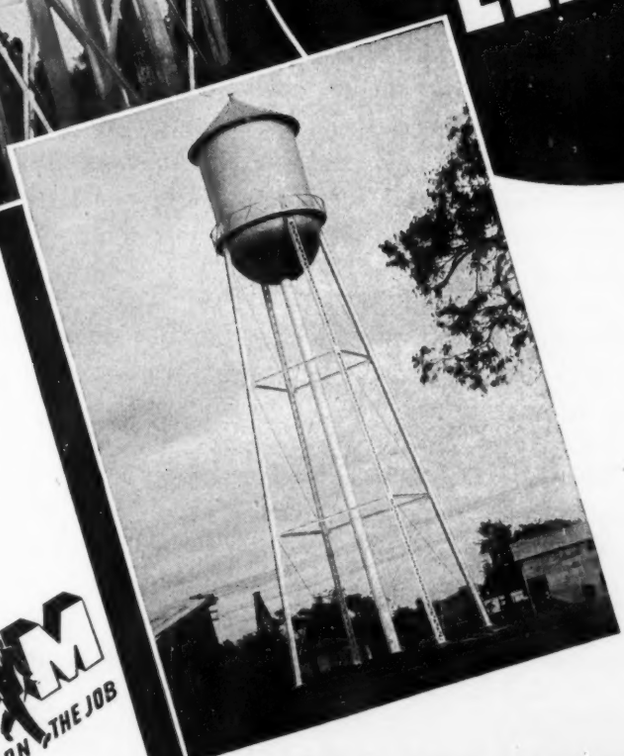
Made by R. D. WOOD COMPANY

Manufacturers of Sand Spun Pipe (centrifugally cast in sand molds) and R. D. Wood heavy-duty gate valves for water works

400 CHESTNUT STREET, PHILADELPHIA, PA.







P·DM MUNICIPAL HEADQUARTERS *for* ELEVATED TANKS

P·DM Elevated Steel Tanks are supplied in all sizes, from 5,000 gals. to 5,000,000 gals. capacity.

P·DM ALWAYS ON THE JOB

P·DM Products for the American Municipality include: Elevated Steel Tanks . . . Steel Reservoirs . . . Water Treating Plants . . . Refuse Incinerators . . . Steel Swimming Pools . . . Steel Grandstands. *Bulletins gladly sent on request.*

● Pittsburgh-Des Moines' high place in the regard of the many municipalities who have invested in P·DM Elevated Steel Tanks is maintained by the sterling performance and lifetime durability of these famous products. The thousands of P·DM Tanks serving villages, towns and cities throughout America prove to everyone's satisfaction that P·DM's "know how" is unsurpassed in modern tank design, fabrication and erection

If improvement is desirable in your own community's water service, it will cost not a whit to have a skilled Pittsburgh-Des Moines Engineer make a preliminary survey of the problem. His broad experience has been gained in dealing with similar needs in like communities —and he will be glad to detail to you and other interested local authorities how P·DM Elevated Water Storage assures continuous water supply at uniform pressures throughout the day and year . . . how it lowers operating costs, and *betters* service for every consumer.

Let us arrange a consultation for you—and meanwhile, send you our informative 20-page bulletin on "Modern Water Storage in Elevated Steel Tanks." No obligation, of course!

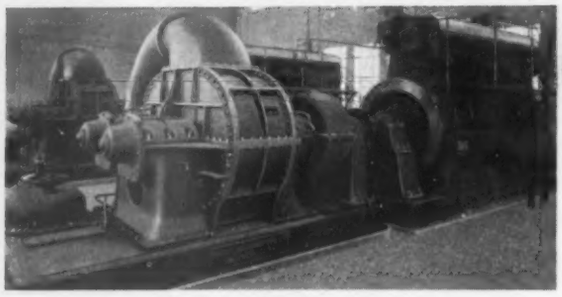
PITTSBURGH • DES MOINES STEEL CO.

PITTSBURGH, PA. 3418 NEVILLE ISLAND—DES MOINES, IOWA. 919 TUTTLE STREET

New York, Room 918-99, 270 Broadway . . . Chicago, 1222 First National Bank Building

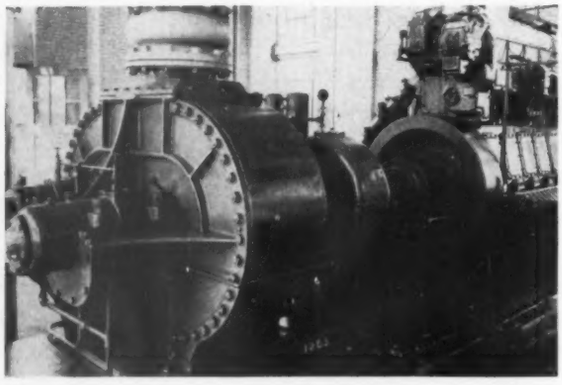
Dallas, 1223 Praetorian Building . . . San Francisco, 625 Rialto Building

Cut Plant Operating Costs by Installing Roots CONNERSVILLE BLOWERS to Supply the AIR

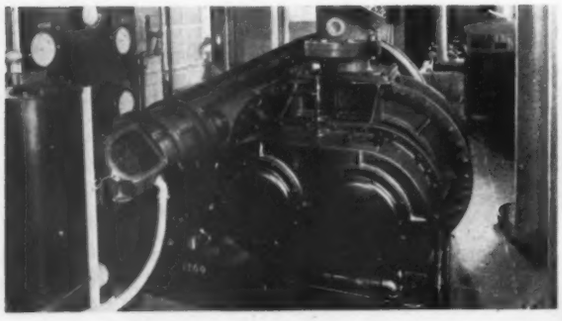


● Two gas engine driven blowers at Cleveland—capacity 10,000 CFM each, 7¼ lbs. pressure.

● Three direct connected, 2-speed synchronous motor driven blowers, at Providence, R. I. Capacity 12,500 CFM each, 7 lbs. pressure.



● Direct connected gas engine driven blower, capacity 4,500 CFM, 7¼ lbs. pressure. Madison, Wisconsin.



● One of two 750 CFM 8-lb. blowers driven by V belt from variable speed motor, at Washington, D. C.

Operating economy is wanted by every sewage plant superintendent.

Definitely established is the fact that Roots-Connersville Rotary Positive Blowers deliver more air per horsepower than any other type. In an installation where direct comparison can be made between a 200 HP motor-driven positive displacement blower and a 200 HP motor-driven centrifugal blower, the plant superintendent shows a saving of $350 per month in purchased electrical energy by running his Roots-Connersville positive displacement blower. This saving will pay for the complete positive displacement blower installation in less than a year and a half.

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WATER WORKS & SEWERAGE

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In COMING Issues

"Progress and Developments of the Year in Sewerage and Sewage Treatment," as in past years, is being featured in our February number. The reviewer this year is LEWIS V. CARPENTER, Professor of Sanitary Engineering, New York University, who is full of things seen and heard while making a transcontinental trip to the West Coast and back. Those who have read Professor Carpenter's reviews of water supply developments in our review issues of past year will know what to expect in our February issue. Dean Saville knew what he was about when he brought Carpenter from the University of West Virginia to N. Y. U. We knew what we were about when we prevailed upon the "Prof." to undertake the forthcoming review of sewerage progress in 1938.

"The Principles of Power Generation from Sewage Gas"—by NORMAN C. WITTWER, Supervising Engineer, Rahway Valley (N. J.) Treatment Plant, constitutes a discussion of the principles and basic factors in the economics of power generation with gas engine—generator units at sewage treatment plants. The author has recently completed a thorough investigation into the economics of producing such by-products for primary treatment plants, in contrast with established values of by-product power for activated sludge plants where purchased current is a pronounced cost factor. The coming article is the outgrowth of Mr. Wittwer's studies and will serve as a valuable guide in design, choice of equipment, and other considerations, for those considering the matter of by-product power generation for primary (or secondary) treatment plants.

"Stabilization of Lime Treated Water and Practical Methods of Testing" is a high rating contribution from H. O. HARTUNG, Chemist of the St. Louis County Water Co. It records experiences and results with two principal methods of stabilization at the St. Louis County plant. It constitutes a valuable sequel to the Hoover-Rice article which appears in this issue, revealing the potentialities of a new and seemingly revolutionizing method of extending the flexibility of lime treatment in corrosion control and in softening, without the encrustation bugaboo. Mr. Hartung in the next issue presents a discussion and careful evaluation of the new hexametaphosphate method of "Threshold Treatment." These three contributors are certainly putting the "Hex" on lime treatment problems.

"The Maintenance of Tanks and Standpipes"—constitutes a revelation of experiences of the West Virginia Water Service Co., with methods of conditioning and maintaining tanks and standpipes serving properties in this company's system. The author is WM. S. STAUB, engineer of this company. Those who have read his earlier contributions will need no further introduction or encouragement to watch for this article.

DR. WILLEM RUDOLFS who needs no introduction in the sanitation field, has been signed up for one or more articles which will recount what he heard and saw of especial interest in sewerage developments while on a recent trip abroad—particularly some outstanding developments in Holland.

VOL. 86, No. 1

CONTENTS

JANUARY, 1939

Water Supply Progress—A Review 1
By REEVES NEWSOM
President, The American Water Works Association

Threshold Treatment of Water 10
By CHARLES P. HOOVER
Superintendent, Water Purification Plant, Columbus, Ohio, and
OWEN RICE
Research Engineer, Hall Laboratories, Pittsburgh, Pa.

Rahway Valley Sewage Treatment Plant 13
By NORMAN C. WITTWER
Supervising Sanitary Engineer, Rahway, N. J.

Compressed Air at Little Cost—A Kink 20
By W. F. SCHAPHORST, M. E.
Newark, N. J.

New England Water Works Association December Meeting 21

North Carolina Water and Sewage Works Association Meeting . 25

Hazards at Sewage Treatment Plants 32
By LAWRENCE LUTHUR
Manager, Department Sanitation, Freeport, Long Island

Charles P. Hoover Honored by Associates and His City 34

A Couple of Ideas and Some Gadgets 35
By "DOC" TAYLOR
Plant Superintendent, Roanoke, Va., Water Department

N. Y. Section A.W.W.A. Meeting 36

Sewerage Financing—Modern Methods and Experience 37
By W. F. TEMPEST
Municipal Bureau, Portland Cement Association

Any Root or Any Power of Any Number 40
By W. F. SCHAPHORST, M. E.
Newark, N. J.

Long Island Sewage Works Association Quarterly Meeting 41

The Editor's Comments 43

Equipment and Manufacturers' News ..... Ad. Page 66

Meetings Scheduled ..... Ad. Page 69

Catalogs and Literature Received ..... Ad. Page 70

Index for 1938 ..... Ad. Page 75

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WATER WORKS & SEWERAGE

VOLUME 86, NO. 1 *A Gillette Publication* JANUARY, 1939

WATER SUPPLY PROGRESS

A Year-End Recounting of Developments and Trends In Water Supply and Water Treatment Practices

By REEVES NEWSOM*
President, The American Water Works Association

The Author

THE year 1938 will be remembered by many operators because water revenues were sadly depleted, not only by poor business conditions, but by the abnormally heavy rainfall in many parts of the country during the summer.

The year's happenings have contributed further to the evidence that has been accumulating since the beginning of the present decade, that our so-called long time weather records covering approximately a century and a half are but a portion of a cycle. Engineers and water works operators are further convinced that to design works properly to meet all probable conditions, records for 500 or perhaps 1,000 years should be available.

The droughts of 1930-31, 1934 and 1936 went beyond available records in numerous places. The cold weather of 1935-36 was more general, penetrated farther south and was of more prolonged severity than had been encountered by the oldest operators. The Ohio and Connecticut valley floods of 1936 and the Ohio again in 1937 left high water marks above those established during 170 years.

In the spring of 1938 rainfall occurred in southern California of such quantity and duration as to go beyond anything that records indicated and overtaxed and washed away many sewerage facilities in a number of cities, and causing damage estimated at $50,000,000. To top all these occurrences, so far during the thirties, a hurricane and a wall of water unlike anything in 123 years hit, first Long Island, and then New England, and to an extent eastern New York.

Dozens of communities were without power for their motor-driven pumps, mains were washed away, hydrants were broken by falling trees and buildings, dams were washed out and reservoirs destroyed, other reservoirs were flooded with salt water, sedimentation basins and clear wells were flooded with contaminated water, elevated storage was destroyed and a number of communities were without water service for approximately a week.

Beyond this many houses, particularly at the beaches and resorts, were demolished, and customers of water systems permanently lost. Hundreds of lives were lost and hundreds of millions of dollars of damage was done, including the irreparable loss of many trees and other landmarks of Revolutionary days. It was a grievous example of the devastation that can be wrought when a territory is suddenly visited with a type of weather which was not contemplated when the elements of its civilized life were designed.

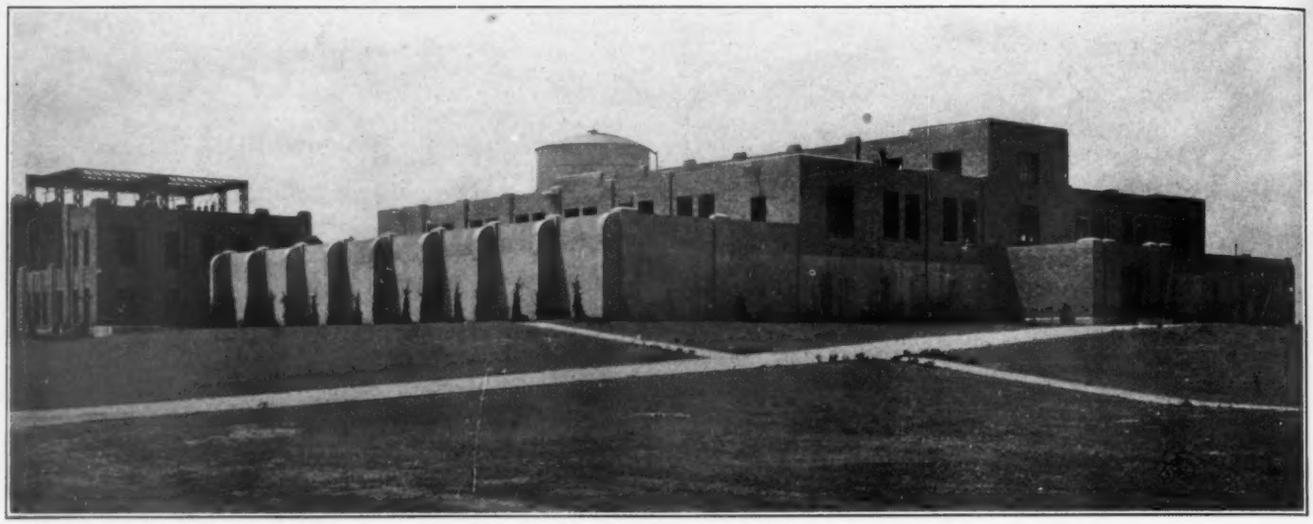
At the beginning of the year water works operators were preparing to take up again the accustomed thread of their existence and to cope with the difficulties of convincing local authorities of the need of carrying on improvements without Federal aid which had been discontinued. About the middle of May new funds were voted by Congress, and almost over night the industry was in the midst of a mad scramble to get plans made and applications filed to meet certain dates before which work must be started, or P.W.A. grants would not be available. First, a date early in August represented the deadline, then September 30th was set as the time before which all applications must be in, and near the year end ability to get work started in a few days became a prerequisite for a grant.

There resulted the greatest concentration of effort to design and plan by engineers and operators, to estimate costs and submit bids by material and equipment purveyors, and to manufacture, ship and start installation by the combined forces of all interested parties that the water works industry has ever known.

Accomplishments Under P. W. A.

During the period from the latter part of May until the middle of December, nearly 1,100 water supply projects at an estimated cost of approximately $170,000,000 were approved. This compares with just under 2,100 projects estimated to cost slightly over $260,000,000 approved during the five-year period ending in September, 1938. Substantially all these improvements

*Engineer-Consultant, New York, N. Y.



The St. Louis County Water Co.'s New Filter Plant Has Many Features of Note.

which cover every phase of water works operation will be completed in 1939.

Included among the larger projects for which P.W.A. approval has been granted during 1938 are the following:

A supply from Lake Erie for the city of Toledo at a cost of $6,440,000. Ultimate cost of the project to be $9,200,000.

Improvements to the Metropolitan District Water Supply of Boston, costing $15,522,000, consisting primarily of an aqueduct to replace a canal now conducting Wachusett water to distribution reservoirs.

A new supply for Wichita, Kansas, consisting of wells, pump station and supply line, costing $2,425,000.

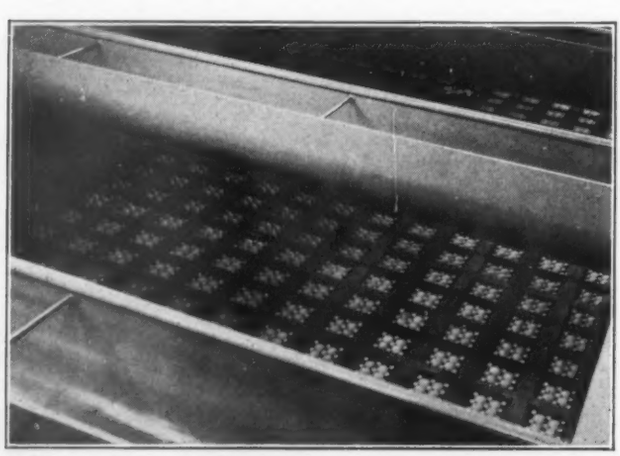
Improvements at Cincinnati to include main pipe lines, pump station and pump, tank and diesel generating plant, to cost $3,145,000.

Rehabilitation of present system and study of a new supply for Binghamton, New York, at estimated cost of $1,100,000.

Improvements to include mains, wells, shop and store buildings, services and meters for Tacoma, Washington, to cost $1,566,000.

An additional supply for Houston, Texas, estimated cost $1,000,000.

Improvements to Grand Rapids, Michigan, system, including reservoir and feeder mains, to cost $4,100,000.



One of the Wheeler Bottoms—St. Louis County Filter Plant.

Meters and new filter plant for Chicago in the amount of $12,000,000. Ultimate cost of project $21,000,000.

A new supply and appurtenant facilities for Harrisburg, Pa., at a cost of $2,800,000.

Supply conduit from Sebago Lake for Portland, Maine, estimated at $1,680,000.

Construction of 36 inch supply main, and other improvements at Phoenix, Arizona, at cost of $1,380,000.

Water works facilities for Greenville, S. C., including 18 m.g. reservoir and 30 inch pipe line, to cost $1,870,000.

A new water system for Renssalaer, New York, estimated to cost $1,150,000.

There are included among the projects to use W.P.A. labor, most of which are relatively small, the following large undertakings:

A softening plant for Flint, Michigan, to cost $941,000.

Extensions of water mains in Buffalo at a cost of over $1,000,000.

A leakage and mapping survey in New York City, $1,360,000.

The installation of mains in Brooklyn, to cost $1,150,000.

Among the projects under consideration for the future not necessarily involving Federal aid and which were being studied during 1938 are included the following:

A 38 m.g.d. water supply for Westchester Co., New York, independent of the city of New York, estimated to cost $20,000,000.

A new water supply for Salt Lake City, including 46 per cent of a dam being built by the Reclamation Service and all the cost of the connecting aqueducts, totalling over $5,000,000.

A new filter plant and elevated storage for Indianapolis, at a cost of $1,475,000.

Reconstruction of dams and reservoirs, constructing new pipe lines and cleaning old pipe in Newark, New Jersey, estimated at $1,200,000.

A new supply for Pittsburgh, Pa., estimated to cost $70,000,000.

A number of interesting and sizable industrial supplies were constructed during the year, including those for large pulp mills at Fernandina and St. Joseph, Florida, and the system at the new Irwin Works of the Carnegie-Illinois Steel Corporation. These latter works are a part of an extensive development of utility services required by this plant. The pump station, from which water is lifted against a 420 ft. head, is of unusually heavy construction to withstand the hydraulic pressure on the walls and the tendency to float during a flood 10 feet above the 1936 crest. Lime is used to correct the pH, and the filter plant is of the Morse type of 6 m.g.d. capacity.

The Golden Gate International Exposition in San Francisco and the World's Fair in New York, to be opened early in 1939, required the development of independent water systems. The New York World's Fair distribution system is designed for an average consumption of 2.5 m.g.d. and a maximum hourly demand of 12.5 m.g.d. In addition it is to be capable of delivering for fire purposes a 3 m.g.d. rate with a 45 lb. residual and a 9 m.g.d. rate at 0 pressure.

Another large dam that is being built by the Reclamation Service—the Shasta Dam—will serve some water supply purposes. This dam is higher than Grand Coulee and has in it 70 per cent more concrete than Boulder dam. It is part of the $170,000,000. Central Valley project of irrigation and flood control. It will also act to replenish ground water in the San Joaquin Valley and to resist salt water incursion in the delta region near San Francisco.

Departures in Filter Plant Design

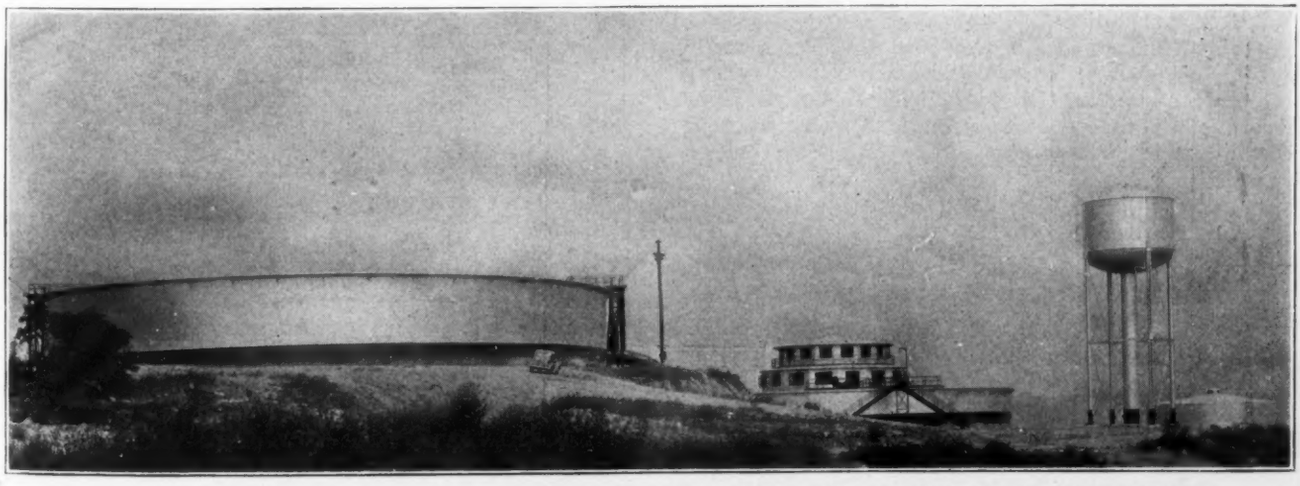
On January 21 the St. Louis County Water Company placed its new filter plant in operation. It comprises eight units of 4½ m.g.d. each, arranged as two separate 18 m.g.d. plants on opposite sides of a common pipe gallery. Each section has its own influent line, flocculation basin, and clear well beneath the four filters.

The underdrain system is of Wheeler type, and the beds incorporated 12 in. of ¾ in. to No. 10 mesh gravel and 27 in. of sand having an effective size of 0.45 m.m. and a uniformity of coefficient of 1.4. The filtration rate is controlled directly by the clear well level, operating on all the filters simultaneously and resulting in a gradual reduction or increase in the rate of filtration.

Little Rock's New Pipe Line—Of 39-in. diameter steel-shell reinforced Lock Joint Pipes.

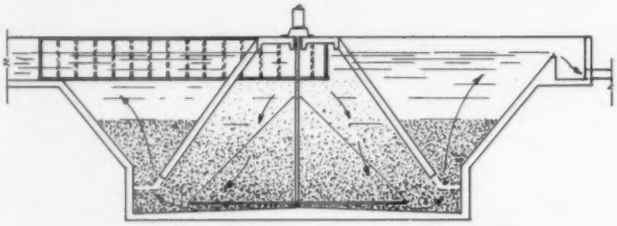
The rate of filtering used in the design of the beds was 3 g.p.m./sq. ft. and during the month of May two units were successfully used at 3⅔ g.p.m./sq. ft. The operation of the plant during the year has shown the design rate to have been conservative, although constituting a definite departure from the rate ordinarily used. The plant has secondary flocculation and water can be filtered to a turbidity of .2 p.p.m. at the designed rate of 3 g.p.m./sq. ft. Before washing, the sand is scrubbed over its entire surface by a stream from a half-inch nozzle at 140 lbs. pressure. Washing is done at a maximum rate of 42 in. rise per min. Repeated tests for mud-balls throughout the year by the Baylis method have not disclosed any indications of their formation.

In February the new Alum Ford Creek supply of the city of Little Rock, Arkansas, was used for the



New Morse Type Filtration Plant at the Irvin Works of the Carnegie Illinois Steel Co. Capacity 6 M.G.D. The large storage tank has a capacity of 3,750,000 gals.; filter plant next, then the wash tank and pure water tank beyond.

first time. While it had not been anticipated that the new supply would be turned in until some time in April, an unusual rainfall of eight inches over the area in and around Little Rock not only filled the newly created impounding reservoir but put out of use the old intake on the Arkansas River.



The Spaulding "Precipitator" in Sectional View. Showing the water swirling downward and then the upflow at diminishing velocity through the floating sludge blanket in the Annular V-Shaped outside Compartment.

The dam had been completed the previous October and the pipe line and sufficient of the other needed facilities were ready for use so that when the emergency arose the new water was turned into the system, although the old filters still had to be used.

The new supply is impounded at a point 35 miles west of Little Rock by an earth dam 115 ft. high and 2,800 ft. long, which was built at a cost of $920,000. The reservoir has an area of 1,240 acres, is 4½ miles long and has a capacity of 14 thousand million gallons. It is approximately 230 ft. above the filter plant in the city and has an estimated safe yield of over 25 million gallons per day. The water has a pH of about 6.7 and an average hardness of but 10 p.p.m. The former supply had total hardness sometimes exceeding 300 p.p.m., made more objectionable by a high chloride content.

The transmission line to the city is of Lock Joint pipe, is 39 inches in diameter and cost $1,600,000 to construct.

Early in the year a 5 m.g.d. filter plant of the Morse type was put in operation at Bristol, Connecticut. The circular all-steel plant includes four filters of 1¼ m.g.d. capacity at a filtering rate of 2 g.p.m./sq. ft. The four sector-shaped units, located between the central well and the semi-annual coagulating basins, are composed of 18 in. of graded gravel and 24 in. of Cape May sand, with an effective size of .47 m.m. and a uniformity coefficient of 1.70.

A unique feature of this plant is the use of a perforated plate between the gravel bed and the supporting steel grating used in the original Morse design. The purpose of the plate is to produce a more uniform distribution of wash water from the false bottom beneath.

The filter at the new Irwin Works of the U. S. Steel Corporation combines a Morse type design and the recent trend toward a higher filtering rate. The rate is 3 g.p.m./sq. ft., the same as that used in the St. Louis County plant opened earlier in the year.

An interesting improvement project now nearing completion is the flood proofing of Louisville's River Pump Station. The work consisted primarily of protecting the steam pumping equipment against a flood 2 ft. lower than in 1937 and the existing electric pumping equipment against a rise to a point five feet above the recent high stage and the installation of two 30 m.g.d. vertical shaft centrifugal pumps, with motors to drive them placed ten feet above the 1937 crest.

The protection of regular equipment was done by raising the window sills five feet and providing folding steel doorways and a steel bulkhead in a passageway between buildings. The new pumps were placed in two existing suction wells in another building and the motors and controls installed on a new balcony with floor elevation well above the last flood. At Evansville, Cincinnati, and a number of other cities, works are being carried on to provide for keeping plants in operation under even more severe conditions than were experienced in 1937.

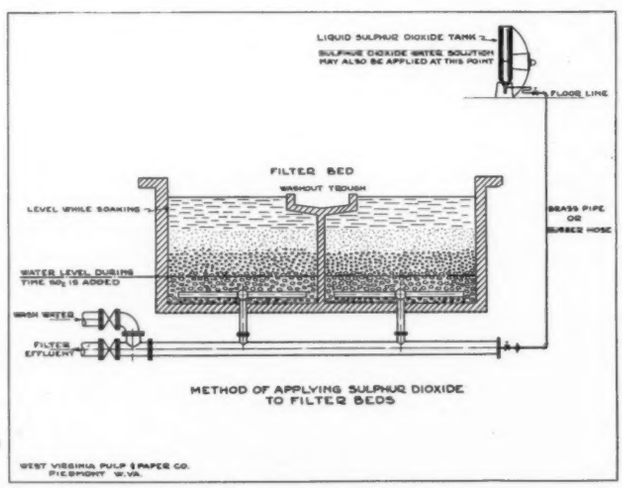
Developments in Operating Practices

While 1938 has been a busy year in the construction phases of the industry, new developments in the fields of equipment and materials and methods and operating practice have not lagged.

There is a well defined trend toward considering treatment of water as more than mere purification. It is developing into the art of conditioning water so that it is not only safe, but more evenly palatable, better for bathing and washing, less detrimental to the piping which carries it, and free from chemicals that do not agree with the functions of the human body. And with this has come a consciousness of a responsibility on the part of the water works operator to see that the water he furnishes remains as he has purified and conditioned it until it is actually used.

Softening and Stabilization

The softening water is becoming more general and in connection with the increase in the number of plants an increased use of equipment to speed up the process is found. The Spaulding Precipitator is now available commercially as is another device called the "Accelator." Both of these devices bring about the re-use of sludge, previously formed, by keeping it in suspension and contact with the water passing through materially longer than in the ordinary mixing, coagulating and sedimentation tanks. Precipitators, of the type developed at Springfield, Illinois, where three 6 m.g.d. units are in operation, are being incorporated in the softening plant under construction at Minneapolis. In this plant there will be twelve units, each capable of treating 10 m.g.d.


LIQUID SULPHUR DIOXIDE TANK
SULPHUR DIOXIDE WATER SOLUTION MAY ALSO BE APPLIED AT THIS POINT
FLOOR LINE
FILTER BED
WASHOUT TROUGH
LEVEL WHILE SOAKING
BRASS PIPE OR RUBBER HOSE
WATER LEVEL DURING TIME SO2 IS ADDED
WASH WATER
FILTER EFFLUENT
METHOD OF APPLYING SULPHUR DIOXIDE TO FILTER BEDS
WEST VIRGINIA PULP & PAPER CO. PIEDMONT, W. VA.

Sketch Depicting Method of Applying Sulphur Dioxide to Cleanse Filter Beds.

These processes result not only in a more rapid reaction and clarification of the water, but better stabilization and less dependence upon recarbonization.

In connection with the subject of stabilization and bearing on the problem of corrosion prevention, the experiences of Chas. P. Hoover at Delaware and Mt. Sterling, Ohio, with Sodium Hexa-metaphosphate (trade name "Calgon") have opened up a very promising field.* "Calgon," first used in boiler water treatment, was found to have the interesting property of holding calcium carbonate in solution even when the dosage was as small as 2 p.p.m. Indications are that this material may make recarbonization unnecessary, may make possible the carrying of high pH water in mains without excess encrustations near the plant or the chokage of hot water systems, and thus result in a more uniform water throughout the distribution system.

Silica as Coagulation Aid

John R. Baylis has continued his worthy contributions in the field of water treatment through the releasing of the results of his further work at the Chicago Experimental Filtration Plant. These results have been of great benefit to the water works industry in general during the period of preparation for filtration and it now seems that with the actual beginning of construction of a filter plant, the city of Chicago will begin to participate more fully in those benefits.

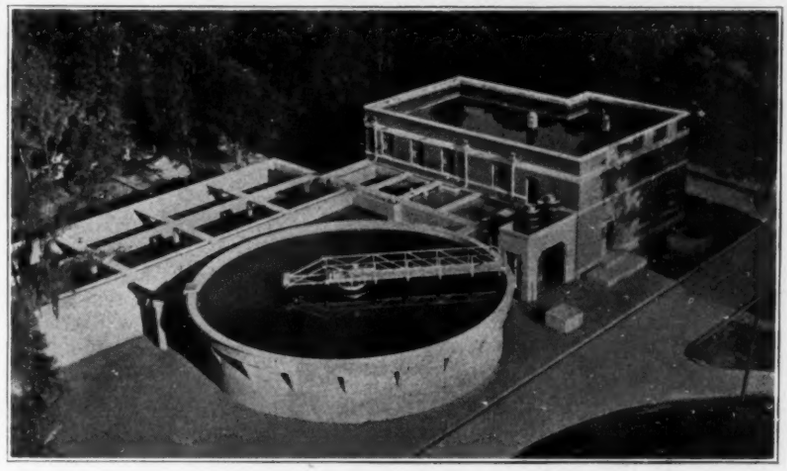
The results of further experiments on the aid to coagulation by the use of acid-treated sodium silicate carried on between January and May, 1938, further confirmed and defined Mr. Baylis' previous findings. He found that during periods of cold water, the weak character of the floc resulted in its deep penetration into the filter beds, even when relatively fine sand was used. These periods of weak coagulation limit the size of the sand and the rate of filtration which may be used.

When the acid-treated sodium silicate was used, the picture was greatly changed. The floc became tough and resistant and with a filtering rate of 3.2 g.p.m./sq. ft. and with sand as coarse as .77 m.m. effective size, good results were obtained in treating the Lake Michigan water. The amount of silicate used was (in terms of silica SiO_2) approximately 40 per cent of the aluminum sulphate.

Application of this aid to coagulation at the Wheeling, West Virginia, plant at times of high flow in the Ohio when the silica content (ordinarily about 9 p.p.m.) reached the vanishing point, produced surprising and gratifying results. Employing 0.2 gr./gal. of silica (SiO_2) with an equal amount of sulphate of iron, oxidized with chlorine, yielded results superior to 3 gr./gal. of the coagulant alone.

Cleaning Filter Beds

An adaptation of another chemical product to use in water treatment is found in the cleaning of filter sand with sulphur dioxide. The water in the filter bed is drawn down to the gravel level after thorough washing. From steel cylinders, liquid sulphur dioxide is introduced through connections in the effluent line into the filter manifolds, while admitting water to the bed slowly. This is done at such a rate as to produce an active solution of not over 3 per cent strength. When the bed is filled a recirculation pump and hose line is employed to distribute more effectively the solution. It is then allowed to stand 18 or more hours and subsequently is washed out by three or more washings. Sulphur dioxide appears to be more effective on manganese and iron deposits than has other schemes, but its use is to be avoided where the filter sand is coated with calcium carbonate, since the resulting compounds would cement the sand grains and the gravel particles. This method has been used at Batavia, New York, Valley Stream, Long Island; Frostburg, Maryland; Gastonia, North Carolina; Mount Vernon, Indiana, and in certain industrial supplies. The cost averages about $1.40 per cu. yd., which is less than the cost of cleaning sand mechanically not including the cost of removing and replacing, and the process reduces materially the effective size of the sand grains.



Softening Plant of St. Augustine, Fla.

Surface Wash

Many of the newer filter plants are provided with some form of surface wash. The Milwaukee plant now under construction will use the Baylis type. The recently completed St. Louis County plant uses a hose with ½ in. nozzle under 140 lbs. pressure.

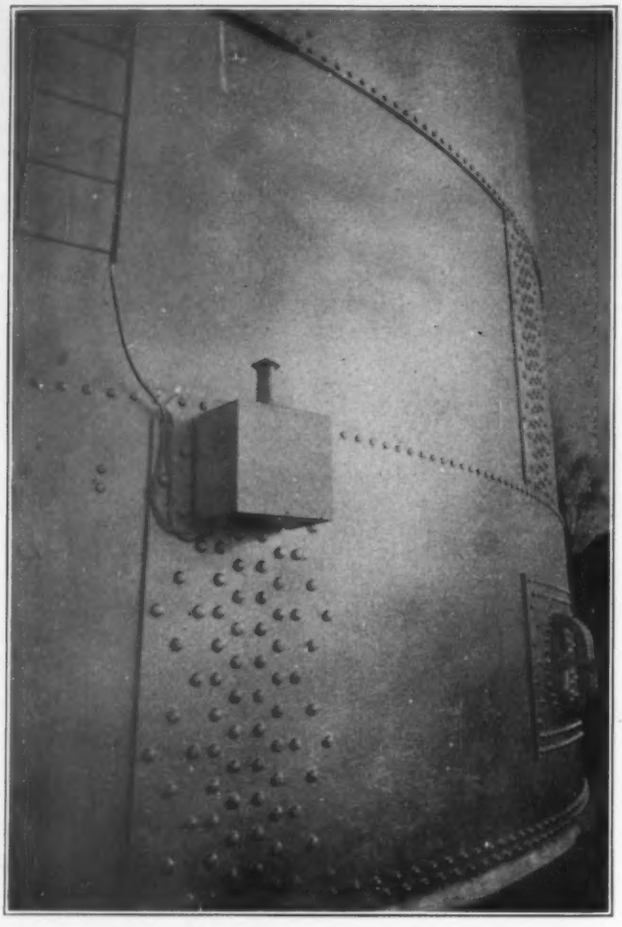
The Jewell sub-surface filter system is effective as a surface wash, entirely aside from the feature of increased filtering capacity.

Another method, developed by Palmer at Erie, Pa., for improving the washing of filters already constructed, is the installation of revolving pipes above the surface of the sand, propelled by the pressure which forces water from openings in the pipe to agitate the surface. Such installations have been made at Erie and Washington, Pa. Agitation of the filter media will allow a lower washing rate and the use of finer particles where Anthrafilt is being used, without a serious loss of filter material.

Carbonaceous Zeolites

Progress in the Zeolite field centers primarily around the possible adaptation to municipal softening of Carbonaceous Zeolites. Zeolites presently used contain large amounts of silica but with the new Zeolite being made from coal carbon predominates. In the process

*Mr. Hoover's article on this development is to be found elsewhere in this issue.—Ed.



Rectifier Installed on a Stand-Pipe Providing Cathodic Protection for Rust Prevention.

of treatment with sulphuric acid, hydrogen is made available as an exchange medium instead of sodium. Among the desirable characteristics are that treatment is effective with water of low pH, iron removal is facilitated by the regeneration with sulphuric acid and filtering rates as high as 6 to 8 g.p.m./sq. ft. are possible, because of the large grain size. The problems involved include the handling of waters containing chlorides and sulphate and the successful control or neutralization of the resulting hydrochloric and sulphuric acid. A unique application of this new CO_2 producing Zeolite is that of recarbonation, secured by shunting some of the raw water through the carbon unit and delivery of such fraction to the lime treated water.

"Defluorite"

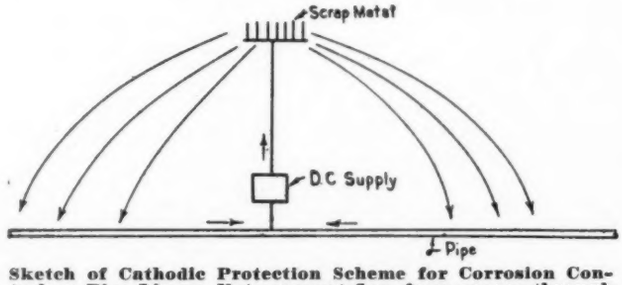
Of the chemicals present in some waters that interfere with proper development of the body, one of the most troublesome is fluorine, which causes dental fluorosis. While recent surveys in Ohio indicate that the danger point may be raised from 1 p.p.m. to 1.5 p.p.m., the successful removal of excess amounts continues to be a problem. Experiments at Amarillo, Texas, and elsewhere, indicate probable success using a special prepared tri-calcium phosphate (marketed under the name of "Defluorite") which was regenerated with caustic soda and carbon dioxide without serious loss of the material and with the retention of the original size of the particle. The treatment followed a partial removal of fluorine by the lime softening process. The cost is approximately one cent per thousand gallons for each p.p.m. of fluorine removed.

Progress in taste and odor removal by the use of activated carbon was indicated by the report of a committee of the American Water Works Association and the fact that carbons of higher absorbent qualities are now available at no increase in cost. While the committee was unable to agree on a preference between the phenol absorption and the threshold odor tests the report rendered, as one of progress, covered many helpful points for the use of the purchaser of powdered activated carbons.

Corrosion Control and Pipe Protection

During 1938 the problem which probably produced the most thought and discussion continued to be that of corrosion control. At the end of the year it probably remains the most important unsolved problem in the industry. The progress made during 1938 might almost be termed negative, yet the evaluation of past efforts, which was the principal accomplishment of the year, was a necessary step toward any ultimate solution. The statements of Hoover, Wiggan, Norcom and many others largely resolve themselves into the fact that to date chemical treatment has been generally successful in preventing red water troubles but results in preventing tuberculation are spotty and only a start has been made toward a generally satisfactory solution of this difficulty. The action of sodium-hexa metaphosphate previously discussed tends to promote the belief that something not yet found will accomplish the purpose and with the type of men that are available in the industry who are working on this problem, it seems probable that the date is not far distant when the goal will be reached.

In the meantime greater emphasis is being placed on frequent cleaning of important lines, the purchase of lined pipe for transmission and distribution mains and the lining in place of large supply lines. Newark, New Jersey, had 21,000 ft. of 48 in. pipe lined by the Gillespie process and this in addition to 27,000 ft. done two years before. Toledo had a new 48 in. line, 17,000 ft. long, similarly lined in place about a year ago and various projects from 36 in. to 72 in. are under consideration. Added interest has been shown in the Tate process for lining smaller lines in the distribution system, which has been used extensively in England but to date American traffic and service conditions have acted as a deterrent to its use in this country. Progress in the search for a better lining for cast-iron pipes



Sketch of Cathodic Protection Scheme for Corrosion Control on Pipe Lines. Note current flow from source through the earth into the pipe.

than the widely used tar dip was indicated by the introduction early in the year of a thin cement lining covered with a coat of asphalt paint under the trade name of "Enameline." Interestingly, this lining is furnished at no extra cost over ordinary tar coating.

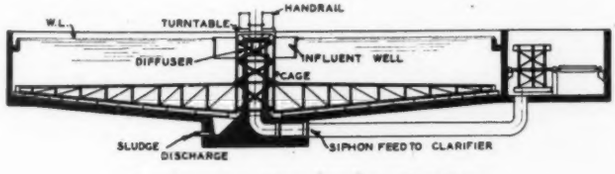
Plumbing Cross-Connection Hazards

As an outgrowth of the publication in December, 1937, by the U. S. Public Health Service of the results

of a plumbing survey of federal buildings in New York City and Detroit, considerable impetus was given to the growing consciousness on the part of water works men that it probably should be a part of their responsibility to see that water so carefully conditioned by them is not contaminated while passing through the pipes and fixtures in buildings. A number of articles have appeared on the subject of plumbing hazards and at several association meetings the problem has been discussed. From all this has developed a renewal of the efforts of A.W.W.A., N.E.W.W.A. and A.P.H.A. to find a working basis for sponsoring and directing through the American Standards Association the testing of plumbing fixtures at the laboratory of the Master Plumbers' Association at the University of Iowa. It is anticipated that this work will now go forward along the lines agreed upon at conferences of the interested parties in November and December. The availability of an independent agency to approve plumbing fixtures and the tightening of the requirements governing cross-connections that is taking place in most states will go far toward furnishing water works men a basis for sponsoring the revision of city plumbing codes and the assumption of responsibility for the enforcement of the portions of such codes dealing with the conditions and fixtures which can affect the quality of the water.

Improving Public Relations

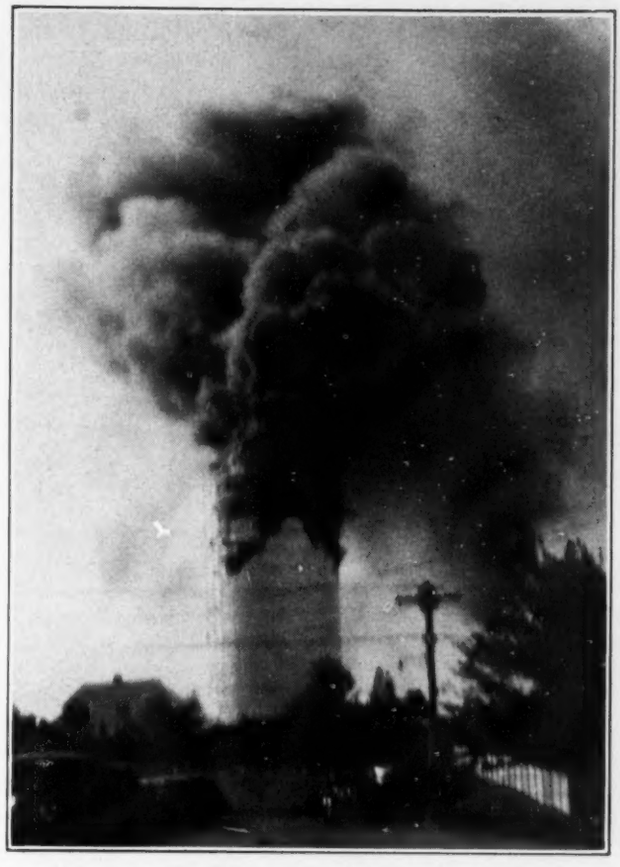
Another form of awakened interest on the part of water works men, increasingly evident during the year past, is in creating and maintaining favorable relations between the water department and its consumers. Private companies have for some years past devoted concentrated thought to this problem and have spent considerable time training employees in properly meeting and treating the consumer who has a grievance, and in the prompt correcting of the conditions causing those complaints which are legitimate. Municipal operators are realizing that good public relations are needed by them if they are to be allowed to carry on free of political interference and to have money made available, when needed, by enlightened voters at bond elections. A number of cities reported on the success of educational campaigns and considerable time was devoted to discussing the problem at numerous water works meetings in the last several months. More helpful publicity in the columns of local newspapers has appeared.



Combination Flocculator—Clarifier.

Special Rates

Two types of rates for service rendered have come in for considerable attention and discussion. The advisability of making promotional rates for sprinkling lawns by cities having surplus water available, as well as special rates for off peak use, was considered on the basis of the experiences in a number of cities in the country. The tendency seems to be to expand such practice, although the field is limited because of the few supplies that are really over size, but operators are cautioned to keep in mind that the time may come soon when the reserve will be needed with a possible bad effect on consumer relations when the special rate is withdrawn.



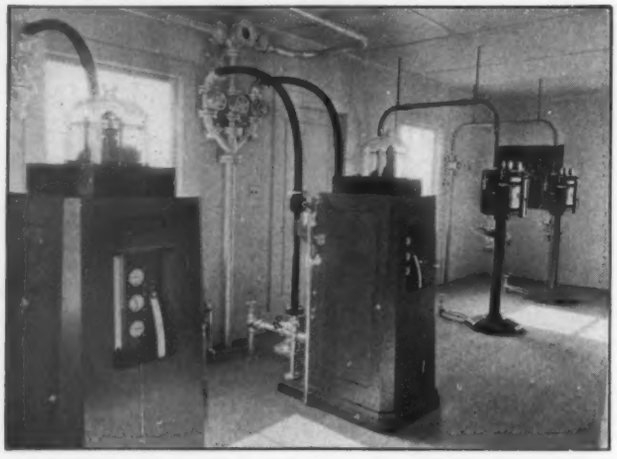
Most Spectacular Picture of the Year. Portland's (Me.) Standpipe Afire.

Evidence is at hand that a better standard for charging for private fire protection is an important need in many situations. Due on the one hand to the very high charges made in some places and on the other to the increased activities of the insurance interests toward trying to have all charges eliminated, water works superintendents in increasing numbers are looking for a reasonable basis for settlement of the controversy. The results of a survey of current regulators and charges in New York state presented this fall leads the way toward an intelligent country-wide attack on the problem.

In this field of special types of service, the growth of air conditioning is among the most important. While there is not entire unanimity of opinion, the general tenor of the 1938 reports on the subject was that, with the more common use of the evaporative condenser, what appeared a year or so ago as a major problem for both water distribution and sewerage systems now seems to be very much less of a problem. With this type of condenser, cooling systems use as make-up only about 10 per cent of the amount of water the earlier types of equipment required. The difficulties therefore seem to be limited to the congested areas in cities where numerous installations develop a concentration of demand which is greatest when other demands are at peak, but even in these circumstances it is now believed that the problem is susceptible to an economic solution.

The Electric Grounding Problem

Some light was cast during the latter part of the year on the old problem of what to do about allowing electric companies to ground house wiring circuits on the water service line. The American Research Committee on Grounding, working under the National Electric Safety Code Committee, reports progress but cautions against premature conclusions. The principal element in the progress made resulted from the recent



"Chloraminating" Station on San Francisco's Hetch Hetchy Aqueduct.
Went into service for control of Crenothryx and other flow reducing and taste producing growths.

availability of an instrument which will measure the flow of alternating current in the piping without having to break the circuit to insert a meter. Field studies in 35 cases so far made have demonstrated that unexpectedly large amounts of current are found to be flowing in water pipe leading out of the basement, as much as 60 per cent of the total electric load in the house. While the committee does not yet know whether trouble in the piping is produced or aggravated by this alternating current the definite need for such a ground, from the viewpoint of electric protection for the householder and his property, seems evident from the amounts of current flowing. The answer to the combined problem is not, therefore, the indiscriminate pulling off of ground wires now existing. Further experiment and investigation are needed before recommendations as to what needs to be done and how to do it can be made.

Catholic Protection Extended to Tanks

In the field of *useful* applications of electric currents to water works operation, the experiences at St. Clairsville, Ohio, and elsewhere, with a form of cathodic protection to prevent corrosion in steel water tanks are of interest. This variation from the work that has been going on in protecting buried metal pipe lines from the effects of soil corrosion appears to have possibilities. The equipment required is relatively simple and can be obtained commercially. A stainless steel cylindrical electrode was hung at the center of an elevated tank, supported but insulated from the roof. From this electrode D.C. current flowed radially to the tank walls in the amount of 1 amp. at 14 volts. After three months' operation tuberculation and rust had to a considerable extent dropped off and the iron appeared to be covered with a slight film. The equipment cost $325 and for the particular tank of 200,000 gallons' capacity the cost of current at 2 cents per K.W. was 40 cents per month. The tank had not been painted for 9 years and was in bad need of protection when the protective equipment was installed.

Another interesting application of electricity was the use in the Los Angeles water department of an electromagnetic thickness gauge to inspect the coating on 13,000 feet of 24 and 36 in. enameled steel pipe. It enabled the inspectors to determine the condition of substantially all the coating instead of only at sample points and to do it continuously and rapidly by walking along the pipe as it was revolved.

Increasing Use of Steel Noted

Among the continuing trends that have been in evidence in the last few years, there should be noted the increasing use of steel not only for pipe lines, but for complete filter plants and for tanks and standpipes as large as 3 m.g. capacity, instead of earth or concrete reservoirs; the use of joints dependent upon the life of rubber to measure their longevity; the installation of diesel engine driven pumping units for daily service as peak demand use, and gasoline driven units for standby service; the use of recorders attached to consumers' meters to determine proper sizing, and to amicably settle complaints; the use of automatic valves in connection with additional zoning of pressures, the operation of pump stations and the control of pipe line breaks, particularly in long supply mains laid through isolated areas; and the attempts to account for higher percentages of water delivered to distribution systems by surveys; and the adaptation of radio type leak locators, to locate and eliminate underground waste; and, improvements in the standards of meter maintenance.

In connection with meter work a very useful device appeared on the market during the year. It is a rate of test indicator which will show continuously, while meters are on the test line, the rate at which water is passing through them. It works on the principle of the raising and lowering of a floating tapered rotor supported in a tapered glass tube by the volume (velocity) of water flowing through the tube which is in

Machine Connected to Meter for Recording Water Waste on Consumer's Premises or Determining Proper Meter for Service.

series with the meters under test. It operates independent of the pressure and gets away from the uncertainties of rates through the limited number of fixed orifices heretofore employed.

A New Type of Meter

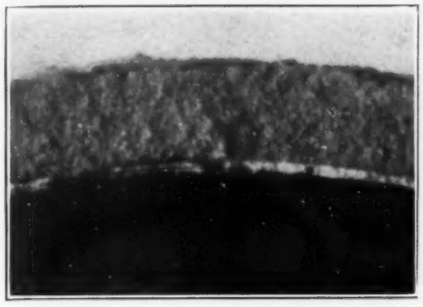
Another innovation in the metering field was the introduction of a meter in which the moving parts in the measuring chamber consists of meshing and rotating hard rubber screws. Great accuracy on low pressure flows and noiseless operation because of the ab-

sence of pulsation, are claimed for it. Reports of performance under actual operating conditions in the field are awaited with interest.

Items of Interest

Of general interest to the water works industry was the death of Typhoid Mary, who in 1907 was the first person recognized as a typhoid carrier. Released in 1910 from the institution in which she had been held on a pledge not to handle food, she was found in 1915 in charge of the kitchen of a hospital where a score were ill. She was returned to isolation in a cottage home on the grounds of an island hospital where she died in November. She was known to have caused seven epidemics and at least 57 cases of typhoid fever.

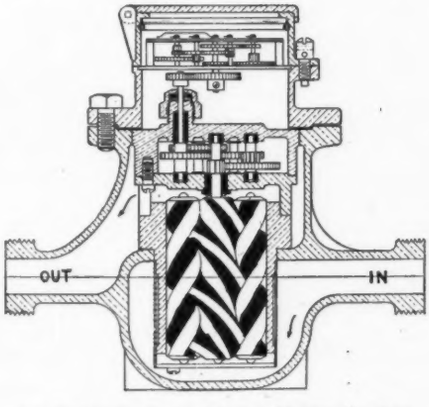
A praise-worthy step in the right direction was the decision by the city of Milwaukee to hold Civil Service



Wall Section of "Enameline" C. I. Pipe. Centrifugally lined with cement and final coat of bitumen.

examinations for the superintendent and assistant superintendent of its new filter plant and to eliminate local residence as a requirement, thus insuring freedom from political influence and a judgment based on ability in the final selection.

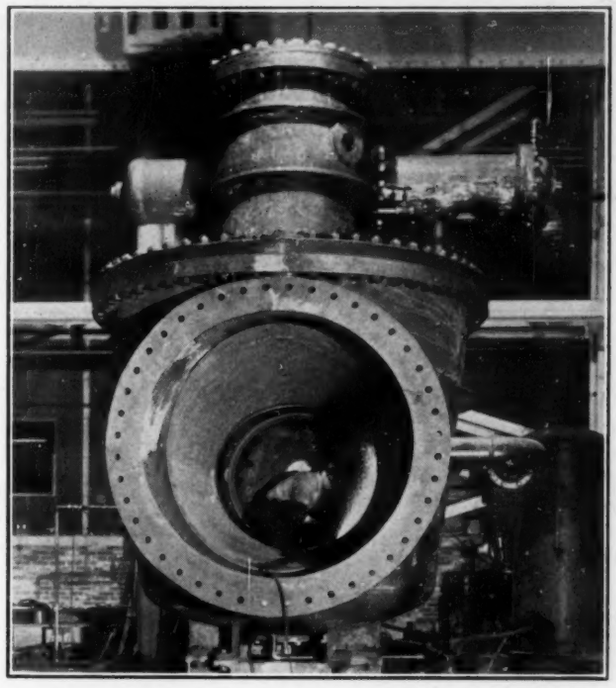
A strike of firemen in the pumping stations in St. Louis because of a jurisdictional argument between two unions in the same group caused failure of water service in portions of the city. It is to be hoped that the indignation of the public and the repudiation of



An Innovation in Water Meter Design Appeared during the Year.

the strike by the head of the union group will prevent this becoming a precedent for strikes so dangerous to life and property that the effect can scarcely be estimated.

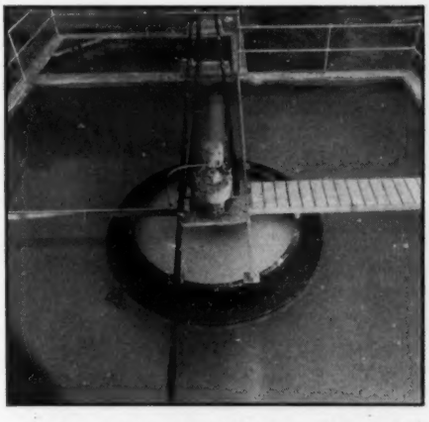
The American Water Works Association has had an active year, both in growth of membership and accomplishment. It has nearly 3,500 members with evidence of increasing interest in all sections of this continent, including Mexico, and also on the island of Cuba. During the year standard specifications for laying cast iron pipe became available for use and a revision of gate



The World's Largest Cone Valve Was Built in 1938 for the Southern California District System. It only weighed 90,000 pounds, approximately—a mere watch charm!

valve specifications were approved to be effective May 1, 1939. A revision of pit-cast pipe specifications and for those hydrants reached the final stages during the year and a start was made toward steel plate work specifications which will include welded pipe and tanks. Collaborating committees have been appointed by the N.E.W.W.A. on valves and hydrants, and the revision of meter specifications. The A.W.W.A. committee on this latter work has been functioning for several months and considerable progress has been made.

The year 1938 will probably be noted for the number of water plants and improvements that have been con-



An "Accelerator" Installed in a Softening Plant.

structed and for the increased interest which operators are showing in taking advantage of the opportunities given them to better inform and equip themselves for their jobs. As a result, not only is water service now available in many places where a few years ago there was little prospect of it, but the art of furnishing water better suited to the varied needs of communities, under pressures more adapted to requirements, with greater dependability of service has made definite progress in 1938, with even firmer foundations laid for the solution of continuing and new problems.

THRESHOLD TREATMENT

A New Method of Stabilizing Water in Softening or Corrosion Control Through Water Conditioning

By CHARLES P. HOOVER
Superintendent, Water Purification Plant, Columbus, Ohio, and
OWEN RICE
Research Engineer, Hall Laboratories, Pittsburgh, Pa.

THE prevention of excessive scale formation from hard or from unstabilized lime softened water has been one of the most stubborn problems for water plant operators to solve. This after-precipitation, productive of excess scale, may be very troublesome for it frequently occurs in the filters, mains, valves, meters, heating coils, hot water storage tanks, pumping equipment and in cooling or circulating systems.

Prevention of scale formation may be accomplished by softening through zeolite, by acid treatment,

The Authors

C. P. Hoover

Owen Rice

or by lime softening followed by recarbonation. However, if any of these softening processes are carried too far, the treated water becomes corrosive. Controlled protective scale formation, in connection with any of the above-named processes, has been found to be difficult.

For naturally soft corrosive water or zeolite-softened water, it is not unusual to add lime or soda ash to produce protective scale. However, such treatment is not always adequate for too much of the precipitation may take place near the plant where the water was treated and not enough at the far ends of the distribution system to secure the protection sought.

The addition of strong acids to convert carbonates to sulfates or chlorides is difficult to control and produces an excessive quantity of carbon-dioxide which is difficult to remove.

With waters softened with lime, or lime and soda ash, recarbonation of the treated water before filtration is practiced for the purpose of neutralizing any excess lime and for converting the carbonates of calcium and magnesium into soluble bicarbonates and thus prevent undue scale formation. However, if carbon dioxide is added in sufficient quantities to convert all the normal carbonates, a new problem is introduced. It produces the undesirable effect of dissolving colloidal carbonates and thus increases the carbonate hardness.

And so, it is apparent that all previous attempts at controlling scale formation and after-precipitation, in one way or another, have not been altogether successful.

"Threshold Treatment" with Hexametaphosphate

"Threshold Treatment," it is felt, offers a new method of approach. This treatment, developed by Hall Laboratories,[1] consists in adding a very small quantity of sodium hexametaphosphate $(Na\ PO_3)_6$ to the water. It has been proven that when 2 ppm. (even less in some cases) of sodium hexametaphosphate is added to hard water, or partially softened water such treatment prevents all further precipitation of calcium carbonate. This fact is effectively illustrated in Figure I. Threshold treatment of cooling water, boiler feed water, and in many similar applications where precipitation of calcium carbonate from the water is a problment" offered much to operators of years.[2] These applications were called to the attention of the senior author, and it was readily apparent that the so-called "threshold treatmen" offered much to operators of municipal water plants, as a means of eliminating many of the difficulties with calcium carbonate depositions encountered in treatment plants, water supply systems, and consumers' piping systems.

Extensive physiological research on the properties of hexametaphosphate had previously been under-

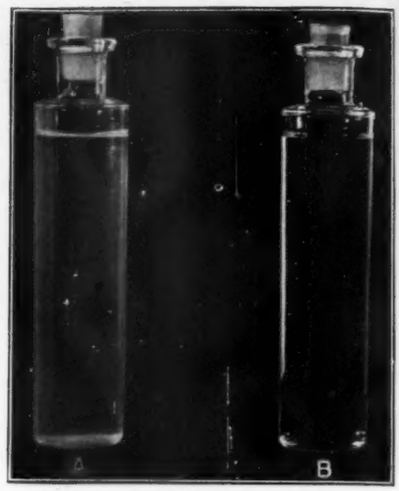


Fig. I.—Effect of Threshold Treatment

Both bottles filled with water containing 250 ppm. of calcium-bicarbonate. To bottle "B" was added 2 ppm. of hexametaphosphate—(trade name "Calgon")—before adding 300 ppm. of soda ash to each. Results—calcium carbonate clouds appeared in "A" within 5 minutes; in the "Calgon" treated bottle "B" no precipitation is visible 24 hours later.
See Table I for long period results.
The effects of "Threshold Treatment" with 2 ppm. of "Calgon" as a precipitation preventive are strikingly evident.

taken at a prominent midwestern university, and when the results of this work demonstrating the absence of any toxic effect, event in relatively concentrated solutions, were presented to the Ohio State Board of Health, permission was readily obtained for trial application in public water supplies in Ohio.

Ohio Plant Tests

The Delaware, Ohio municipal water plant, which is under the supervision of the senior author, was chosen for the first application of threshold treatment to a municipal lime-soda softening plant. This plant pumps an average of 700,000 gallons per day and has been softening the supply since 1915. By the addition of lime and soda ash, the hardness of the water is reduced from an average of approximately 300 ppm. to 100 ppm. Recarbonation has been practiced since 1923, but in order to avoid dissolving too much colloidal carbonate, recarbonation is not carried to the point where after-precipitation of calcium carbonate is prevented. As can be seen by an examination of the data given in Table 1, the average drop in alkalinity through the filters was approximately 30 ppm. From these figures it can be seen that the filters were playing a very important part in the softening process. During the first twenty-four days of May, the alkalinity of the settled water at Delaware av-

eraged 64 ppm., while that of the filtered averaged 31 ppm., showing an average precipitation of calcium carbonate on the filters of 33 ppm. A feed of 2 ppm. of sodium hexametaphosphate was started on the twenty-fifth of May. There was practically no precipitation of calcium carbonate on the filters following this addition. The results are shown in Table No. 1 and Figure II. The results of threshold treatment during June, July and August are also shown in Table 1. During the latter month, the feed was reduced to 1 ppm. and then to ½ ppm. It is evident that the after-precipitation of calcium carbonate was entirely prevented even at these lower feeds.

TABLE I.

Effect of Threshold Treatment on After-Precipitation at Water Softening Plant, Delaware, Ohio.

	Average Results in P.P.M.*				
	Alkalinity			Hardness	Pptd.
Period	Settled	Filtered	City Tap	Filtered	on Sand
1937	69	39	..	108	30
1938—January	76	51	..	118	25
1938—February	70	34	..	95	36
1938—March	68	35	..	94	33
1938—April	66	38	..	99	28
1938—May**	67	38	..	99	28
1938—June	67	66	60	106	1
1938—July	69	69	66	104	0
1938—August	72	73	71	103	—1

*Data obtained from the Ohio State Board of Health.
**Threshold treatment with 2 ppm. was commenced at noon, May 25.

Results Were Striking

While this demonstrated strikingly the tremendous effectiveness of sodium hexametaphosphate in preventing the precipitation of calcium carbonate, it had the disadvantage of preventing the additional softening secured on and within the filter beds. Consequently, where it is desired to obtain the softening action of the filters, the sodium hexametaphosphate should be added following filtration. It will then stabilize the filtered water and will, we believe, prevent or materially modify precipitation throughout the distribution system. Laboratory tests indicate that no precipitation occurs even upon heating fairly hard water to which 2 ppm. of hexametaphosphate has been added. (See Figure III.)

The remarkable results obtained at Delaware in preventing after-precipitation on the sand filters suggest the possibility of adding sodium hexametaphosphate to lime softened unfiltered or high pH softened filtered water before softening through zeolite in order to prevent incrustation of the zeolite mineral.

The entire lime-soda softened water supply at Mt. Sterling, Ohio, is now being treated with hexametaphosphate, and it is proposed to apply it to the entire supply of the City of Columbus, Ohio, after January 1, 1939.

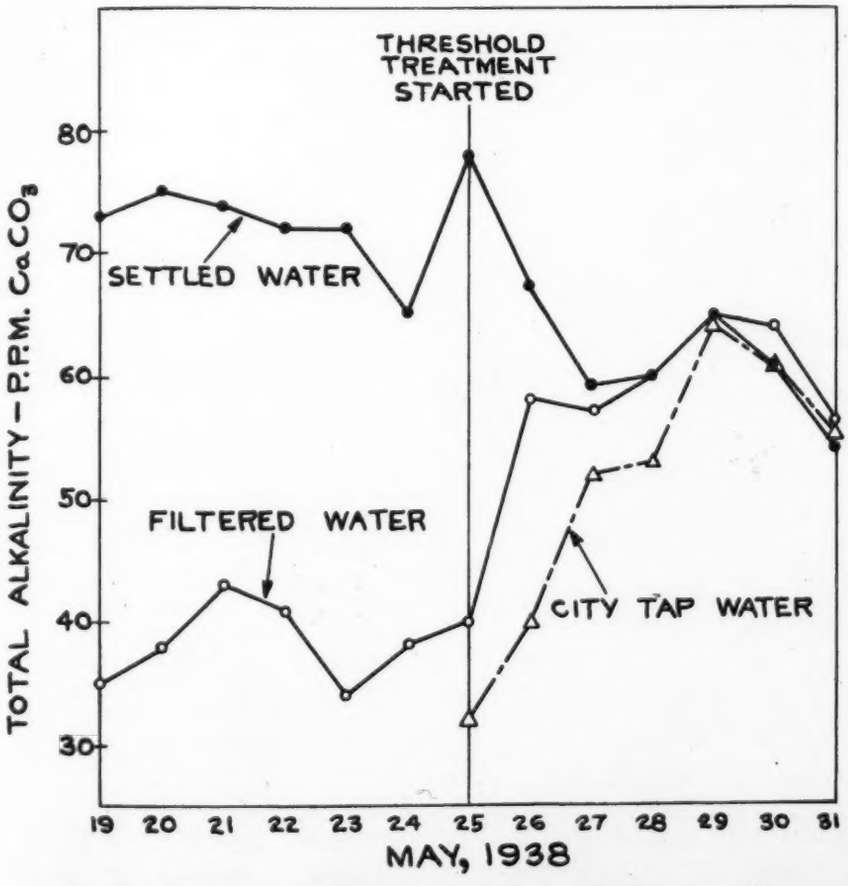


Fig. II.—The Effect of Threshold Treatment at the Delaware, Ohio, Softening Plant

Threshold Treatment of Hard Waters

It has been difficult or even impossible from a practical standpoint to prevent the scaling up of hot water heaters when water high in hardness and bicarbonate alkalinity is used, except by softening the supply. In Figure III, however, the effect of 2 ppm. of sodium hexametaphosphate in preventing the precipitation of calcium carbonate when water high in bicarbonate hardness is heated is shown. These curves show very conclusively that threshold treatment will prevent after precipitation at high temperature even when the carbonate hardness is extremely high, and likewise indicate that excessive scaling of hot water heaters can be prevented.

Threshold Treatment in Corrosion Control

The application of sodium hexametaphosphate to the problems occurring when lime or other alkalines are added for corrosion control is readily apparent from the above, and was mentioned by R. C. Bardwell in his discussion of this subject, given before the Virginia Section of the American Water Works Association, as recounted in the October issue of "Water Works and Sewerage." Mr. Bardwell reported that a small amount of sodium hexametaphosphate had been found helpful in hot water systems in retarding the rapid deposition rate of calcium carbonate under such circumstances. Since the addition of smaller amounts of sodium hexametaphosphate than are required for complete prevention of precipitation results in a slowing up of the deposition of calcium carbonate, it is also conceivable that partial threshold treatment will provide a

means for extending a more uniform and more nearly ideal coating of calcium carbonate throughout the distribution system than is generally attainable.

Conclusion

The plant scale experience at Delaware and Mt. Sterling, Ohio, and a variety of laboratory experiences show that the addition of a small amount of sodium hexametaphosphate will stabilize high carbonate hardness waters. This is valuable, for when excess lime treatment is not needed to reduce magnesium it bids fair to make recarbonation of lime softened water unnecessary, and it may even eliminate softening of hard waters which are softened primarily to prevent incrustations.

The fact that the addition of these small amounts of sodium hexametaphosphate continues to stabilize the water at temperatures approaching the boiling point makes threshold treatment especially valuable in all these applications because trouble with scale in hot water heaters is often encountered even following partial softening or the addition of lime or soda ash for corrosion control.

It seems evident from these data, and experience obtained during the past two years in many similar applications in industrial plants, that wherever problems involving the precipitation of calcium carbonate are encountered in public water supplies, threshold treatment should be considered.

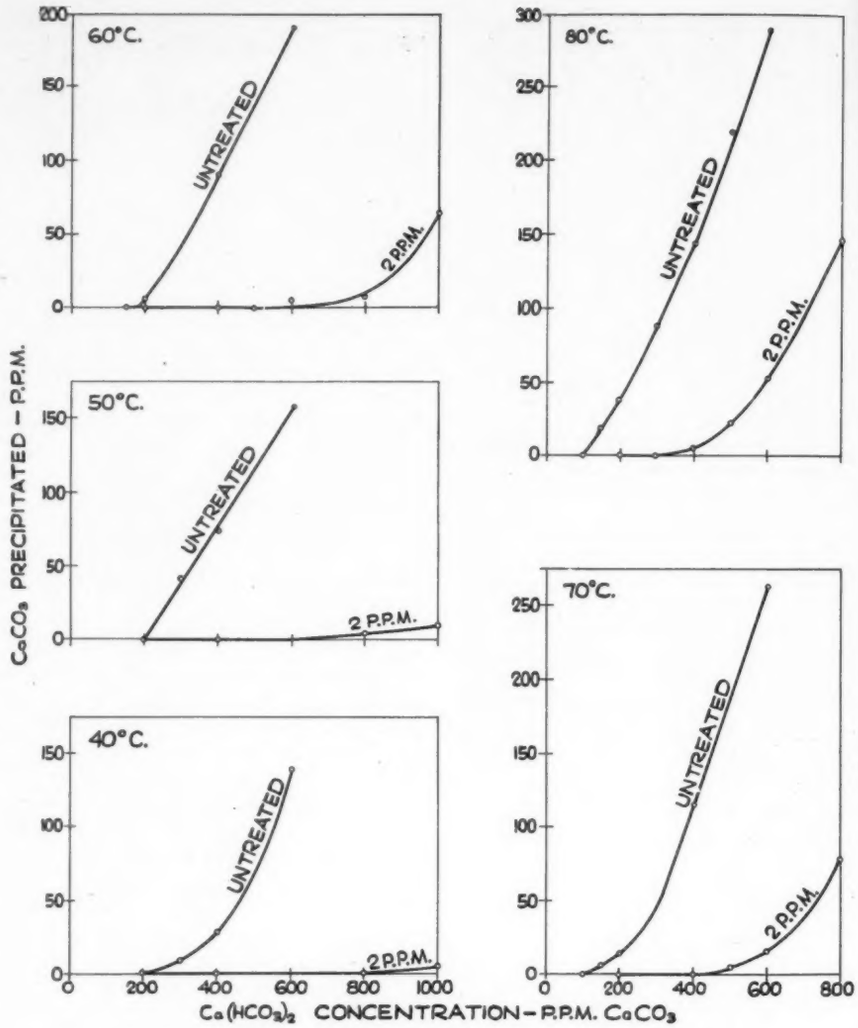
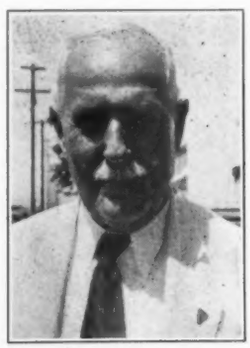


Fig. III.—Samples of Water of Various Degrees of Hardness Before and After Heating to Various Temperatures Indicated for One Hour

Alfred Theard Is Dead Served His Native City 46 Years

Alfred Francis Theard, engineer and general superintendent of the Sewerage and Water Board of New Orleans, died January 2 at his home in New Orleans, after an illness of about six weeks. He was 73 years old.

A native of the city, he was a designer of the world reputed and highly important drainage system on which the very existence of New Orleans is so dependent. He was graduated from the College of Immaculate Conception, practiced consulting engineering for a time, became connected with the office of the City Engineer in 1893 in making the preliminary drainage surveys for the system which he was later to head. In 1902 the joint Sewerage and Water Board was formed and Mr. Theard was given the position of first assistant engineer. In 1914 he was made its chief drainage engineer, and in 1935 was named chief engineer and general superintendent succeeding the late Bryson Vallas. This



Alfred F. Theard

last promotion came on January 2, the day of his death four years after.

A member of the American Public Works Association, Mr. Theard received its veteran's plaque in 1937 for "long and faithful services to his native city of New Orleans, since 1893." He was organizer and a past-president of the Louisiana Engineering Society. He was a member of A.S.C.E. and A.W.W.A. He was author of a number of technical papers, amongst them are those which have already appeared in this magazine. Another, completed shortly before his death, and believed to be the last technical paper to come from his pen, will appear in an early issue.

Mr. Theard possessed many fine qualities, strengthened by a pleasing personality and winning smile. Like most natives of New Orleans, he loved it, and worked hard and long to make of his City of glamour, history, romance and charm a better place to live in. That such was accomplished has been well proven by the records.

Mr. Theard is being succeeded by A. Baldwin Wood, until now chief mechanical engineer of the board.

THE RAHWAY VALLEY SEWAGE TREATMENT PLANT

A Brief Description of the Plant, with Some Operating Observations and Notes

By NORMAN C. WITTWER
Supervising Sanitary Engineer
Rahway, N. J.

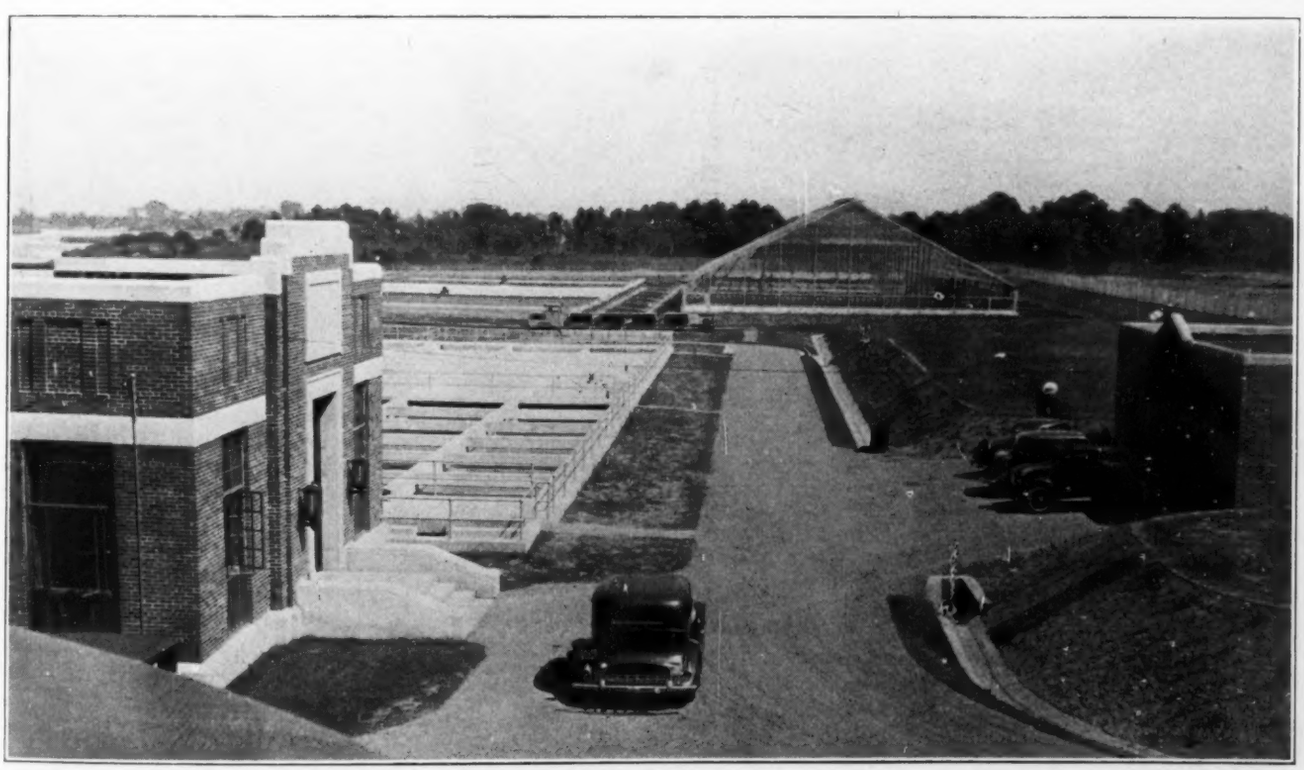
The Author

THE Rahway Valley Joint Meeting is one of the latest of an ever-increasing family of Sewerage Districts to complete a large-scale program for the elimination of pollution from our streams, lakes and tidal waters. The municipalities served by this $3,000,000 project are located in Union and Middlesex Counties, New Jersey, within the metropolitan area of New York City. They range in character from the typical residential suburban type of community to semi-industrial centers. Included are the

Town of Westfield
Township of Cranford
Township of Springfield
Borough of Kenilworth
City of Rahway
Borough of Garwood
Township of Woodbridge
Township of Clark
Borough of Roselle Park

The present population served by the system is approximately 60,000 persons. Due to the activity in building construction in this area, it is probable that this population will increase rapidly in the years to come. Prior to 1928, the sewage from these municipalities was discharged directly into the Rahway River and its tributaries. Some of this sewage was partially and inadequately treated, but most of it entered the streams untreated.

The sewerage program was undertaken by a Joint Meeting entered into by the nine municipalities according to the statutes of the State of New Jersey. All the conditions pertaining to the participation in construction cost, allocation of space in the trunk sewers and sewage treatment plant, and the apportionment of operating and maintenance expense, were embodied in a contract signed on October 20, 1928, by each of the member municipalities, collectively designated as the Rahway Valley Joint Meeting. The construction work was carried out in two distinct phases: (1) The Trunk Sewer System to collect sewage from the internal sewerage systems of the several municipalities; (2) the Sewage Treatment Plant.



A Near View of the Rahway Valley Plant—from one of the Second-Stage Digesters.

Actual construction of the Trunk Sewers was begun in May, 1929, and progressed continuously until their completion in April, 1931. The main trunk sewer is laid up the valley of the Rahway River from the City of Rahway to the Township of Springfield. Branches or spurs extend from the main trunk to collect the sewage from Westfield, Garwood, Roselle Park and Woodbridge. Pipe sizes range from 15-inches to 72-inches in diameter.

All sewers are designed for the estimated maximum flows in 1960, when flowing full. Capacities increase progressively toward the Sewage Treatment Plant, where the capacity of the 72-inch diameter sewer is rated at 55,000,000 gallons per day.

The Treatment Plant

Construction of the Sewage Treatment Plant was begun in November, 1935, and was completed and in readiness for operation on June 1, 1937. The location of the plant is at the terminus of the Trunk Sewer on the south bank of the Rahway River in Woodbridge Township. The effluent from the plant is discharged into the Rahway River, a tidal stream tributary to the Arthur Kill which extends around the western side of Staten Island in lower New York Harbor.

In common with the general policy of "pollution reduction" which prevails in these tidal waters, the treatment adopted consists of grit removal, primary sedimentation and disinfection with chlorine. Fundamentally, the results to be accomplished may be stated as follows:

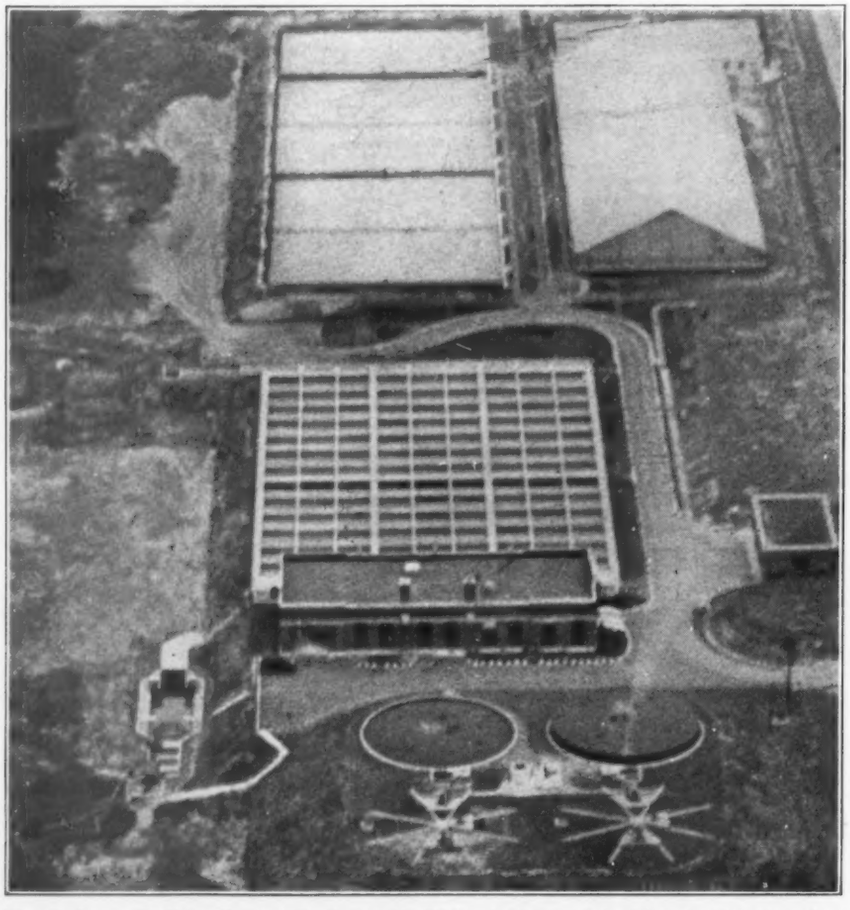
(1) Removal, so far as is practicable, of settleable suspended solids from the sewage before it enters the river so as to eliminate the formation of sludge banks and the consequent putrefactive conditions.

(2) Reduction of the biochemical oxygen demand of the sewage, to likewise reduce putrefactive conditions in the river.

(3) Reduction or elimination of offensive odors.

(4) Disinfection of the sewage during the summer months so as to reduce or eliminate the introduction of harmful bacteria into the river.

Upon the completion of the Sewage Treatment Plant, the entire system was placed in full operation, and final connections to the Trunk Sewers were made by several municipalities not previously connected.



The Rahway Valley Plant—(Fuller & McClintock, Engrs.) looking in the direction of flow through the plant. Just out of the picture on left is the Rahway River; Two-stage sludge digesters in foreground; Screen and grit-chamber on left.

Design Capacities

The component parts of the Sewage Treatment Plant have varying design capacities, depending largely upon the ease with which these parts may or may not be extended or enlarged. All fixed, not readily-extendable units in the plant are designed for the maximum capacity of the Trunk Sewer of 55,000,000 gallons per day. Other units have smaller capacities. Individually, they are as follows:

Grit Chamber..55,000,000 gals. per day
Mechanical Bar Screen.....
.....55,000,000 gals. per day
Screenings Incinerator .....
.....250 lbs. per hr. (wet)
Sewage Pumps..56,000,000 gals. per day
Settling Tanks (4-hr. detention)...
.....12,500,000 gals. per day
Digestion Tanks (2 cu. ft./capita).
..... 75,000 persons
Raw Sludge Pump..160 gals. per minute
Sludge Drying Beds.....75,000 persons
Chlorinators.....3,500 lbs. per day
Outfall Sewer..55,000,000 gals. per day

Thus the aims of the Rahway Valley Joint Meeting have been accomplished, at least for the time being. Capital outlays should not be required in the near future for the Trunk Sewers or Treatment Plant except for the following purposes:

(1) The installation of equipment, or structures, or both, which, when the capital cost is properly amortized, will result in definite savings in total annual operating expense.

(2) The provision of such equipment or structures, the necessity for which may be learned from operating experience.

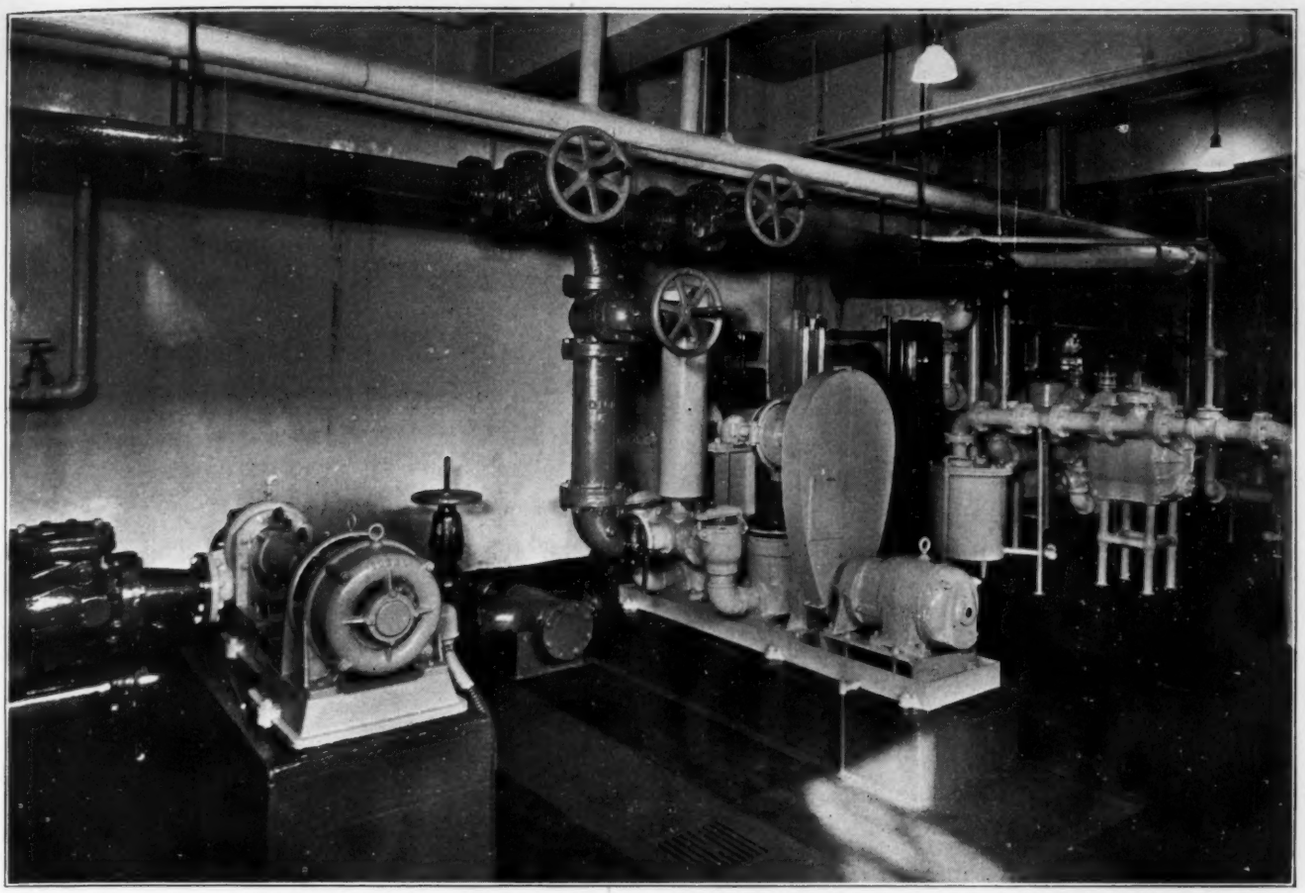
(3) The provision of such experimental units and equipment as may be deemed necessary from time to time to insure the future enlargement and development of the plant along the most effective and economical lines.

Component Units of the Plant

The plant was designed and constructed along conventional lines with no startling innovations or untried features. For this reason, probably, no major operating difficulties were encountered in the first few months of operation. Adjustments were required to several of the lesser items of mechanical equipment, but, from a practical point of view, the functioning of all the component parts of the plant has been entirely satisfactory.

Grit Chamber

The sewage enters the plant through a grit chamber which has a trapezoidal-shaped channel and which is provided with a Link-Belt scraper-type grit collector and an inclined grit washing and dewatering screw conveyor. This conveyor



Boiler Room of the Rahway Valley Plant.
Sludge Pumps (note two types) and Gas Collection Equipment Beyond.

carries the grit up a galvanized iron trough and discharges it on to a grit storage platform. All grit recovered is used for fill on the plant grounds.

Bar Screen

The 10-foot wide, mechanically-cleaned bar screen was also installed by the Link Belt Company. It has 1-inch clear openings between the bars and is operated automatically by means of a manually-set time relay. Most of the screenings captured on the screen are being buried in the tidal meadows adjacent to the plant, although at times when the quantity is excessive, they are destroyed in the incinerator.

Screenings Incinerator

Screenings can be burned in a high-temperature Morse Boulger incinerator located adjacent to the screen below the level of the screen room floor. Screenings to be burned are discharged directly on to the drying hearth of the incinerator through a floor-type charging hopper. Sludge digestion gases are used for fuel, the gas pressure being raised by means of a small booster pump. The capacity of the incinerator is 250 pounds of wet screenings per hour.

Sewage Pumps

The sewage is lifted by automatically-controlled Yeomans Brothers horizontal centrifugal pumps to the influent channel of the settling tanks. The pumps are five in number, four of them having capacities of 14 m.g.d. each, and one having a capacity of 7 m.g.d. The float control is so arranged that the pumps operate on a schedule which provides for pumping of 7 m.g.d., up to 56 m.g.d. This large pumping capacity has been well justified, since peak rates of flow of 35 m.g.d. have already been experienced, and the maximum 24-hour flow has been 27.83 m.g.d.

Each pump is separately installed between the suction conduit and the tank influent channel. The discharge tubes are flared to reduce velocities and friction losses, and empty into the influent channel well above the surface of the sewage. Thus, the necessity for gate valves or check valves on the discharge side of the pumps is eliminated.

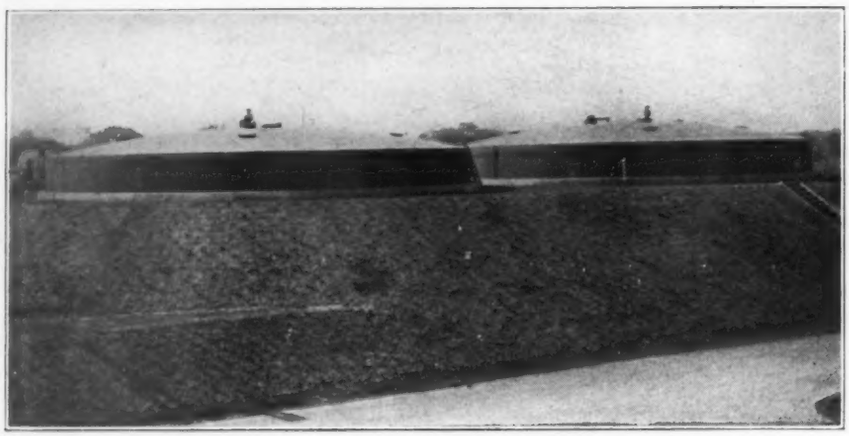
Settling Tanks

The settling tanks are three in number, are rectangular in shape, and are equipped with Link Belt sludge collection equipment. The tanks are 202 feet long at the water line and are 11 feet deep. Each tank is 43 feet wide and is composed of three longitudinal bays. The nine longitudinal sludge collectors (one for each day) deliver the sludge to cross sludge collectors in depressed channels at the influent ends of the tanks. Here the sludge is scraped into sludge pumping sumps from which it can be removed.

The raw sewage is distributed to the settling tanks from a cross-tank header channel, one opening being provided into each of the nine bays. The flows into the individual bays are controlled by handwheel-operated slide gates which can be adjusted so as to secure an even distribution of the total flow. Adjustment of flow distribution is made according to the recorded settleable solids removed from the individual tanks.

Grease Separation and Disposal

The provisions made for grease separation and disposal are somewhat unusual. The grease is scraped from the surface of the sewage into troughs at the effluent end of the tanks in the usual manner. Then it is flushed to a grease separation chamber, in which the grease is separated from its carrying water by the flotation process. It is scraped into buckets and at present is being buried, or it may be burned in the incinerator. The underlying water is then drained from the chamber back to the pump suction conduit to be mixed with the incoming raw sewage.



The Secondary Digestion Tanks Equipped with Floating Gas-holder Covers. In the left background appears one of the turbo-mixers on the primary digesters.

Sludge Digestion Tanks

The sludge digestion tanks have been constructed to incorporate the features of the Dorr two-stage digestion system. This consists of fixed-roof, primary digesters with sludge-stirring devices called turbo-mixers, and gas-holder type secondary digesters. Both the gas and partially digested sludge are transferred automatically from the primary tanks to the secondary tanks.

The layout includes two primary and two secondary tanks, operating in pairs. All tanks are 50 feet in diameter and approximately 20 feet deep, making a total volumetric capacity of 150,000 cubic feet, to provide 2 cubic feet per capita for the design population of 75,000 persons.

The digester piping is very flexible, permitting a number of useful operations, even though these be somewhat unorthodox. Sludge may be withdrawn from the bottom of any digester and pumped back to the inlet of any of the four units. This operation has proved useful at times in correcting foaming. In fact, recirculation of sludge in a tank has eliminated foaming within two days. Sometimes lime was added at the same time. Also, by proper valve adjustment, raw sludge (or sewage) may be forced under pumping pressure into any one of the sludge draw-off pipes. This operation is helpful for clearing stoppages from these lines. In addition, the same pumps which are customarily used for pumping the raw sludge to the digesters may be utilized for removing digested sludge from the tanks. This is convenient when it is necessary to empty one of the tanks, or when the sludge level in the secondary tanks is too low to permit the flow of sludge to the drying beds by gravity.

Sludge Pumps

Two sludge pumps were provided, one a 160 g.p.m. Carter plunger pump, and the other a 300 g.p.m. Yeomans horizontal centrifugal pump. Experience has proven the centrifugal pump to be entirely unsatisfactory for the service imposed on sludge pumps under conditions at this plant. It will doubtless be replaced by a plunger type pump in the near future.

Sludge Disposal

Unlimited ground area being available, sludge drying beds were provided for the air drying of sludge, two-thirds of the total area being open, and one-third being covered with a glass enclosure 80 feet wide by 250 feet long. Experience to date, however, has shown very little difference between the drying efficiency of the open and covered beds. The difference, if any, seems in favor of the open beds. They certainly permit much more rapid drying of sludge in the summer months. The balance may be slightly in favor of the covered beds in the fall months, but in the winter, neither were satisfactory from the point of air drying. Freezing temperatures were depended upon almost entirely to render the undried sludge hard enough so that it could be satisfactorily handled.

Industrial track is laid throughout the drying beds, and the sludge is loaded into 1-cu. ft. capacity dump cars which are moved about by a small locomotive powered with a Ford V-8 engine.

Practically the entire output of dried sludge has been taken from the plant by the Rahway Reformatory which has extensive farms nearby. The taker supplies all labor and trucks for removing the sludge from the beds to the farms.

Disinfection by Pre-chlorination

Chlorine is applied to the raw sewage *ahead of* the settling tanks from May 15th to October 15th of each year. The plant design provides for prechlorination only, which at times affords the added advantage of eliminating or reducing odors due to periodic strong sewages. Since disinfection of the plant effluent is a primary requirement during the summer months, a chlorine residual is carried through the settling tanks notwithstanding their relatively long detention period. Experience to date indicates that a dosage of 10 ppm, or slightly less, is all that is required to insure a positive chlorine residual in the plant effluent *at all times.*

The chlorinating layout is very complete. A large storage room comprises the entire rear end of the service building. Facilities are available for the storage of 19 full one-ton cylinders and 10 empties. The chlorine scale, which is in another room immediately adjacent to the storage room, normally carries five one-ton cylinders, and has an overall capacity of 15,000 pounds. An I-beam monorail with a trolley mounted chain hoist permits the transfer of cylinders from the storage room to the scale room; also to the loading platform, where transfer to and from trucks can be made easily and without hazard.

The chlorinators are Wallace & Tiernan MSV type machines, one having a capacity of 2,000 pounds per 24 hours, and the other 1,500 pounds per 24 hours. The rate of feed is set manually, but the chlorinators cut in and out automatically, in conjunction with pump operations. Settled sewage is used for carrying the chlorine from the chlorinators to the point of application.

Service Building

The Service Building, a one-story brick structure 44 feet wide by 113 feet long, houses the Supervising Engineer's office, the laboratory, two toilets, all sewage and sludge pumping equipment, the heating plant, mechanically-cleaned screen, incinerator, and chlorinating apparatus.

The laboratory is exceptionally complete, providing adequate facilities for all routine control and statistical analyses.

Operating Personnel

The Sewage Treatment Plant is attended twenty-four hours a day. Three shift operators, working 48 hours per week each, alternate on the two night shifts, and on a four-day shift from Friday to Monday. Except for the winter months, the night operators work alone. From December to March, each shift operator is given an assistant (one of the regular laborers) to aid in snow removal, painting, handling screenings and grit; also as a *protection against accidents* during the cold weather.

A chief operator, who is essentially a master mechanic, also performs the duties of assistant to the supervising sanitary engineer. A full-time chemist is employed in the laboratory for routine control analyses.

The operating personnel is as follows:

1 Supervising Sanitary Engineer
1 Chief Operator
1 Chemist
3 Shift Operators
1 Truck Driver
1 Assistant Operator
*6 Laborers
1 Clerk

*In addition to their duties at the plant, these men also take care of the maintenance of 18 miles of trunk sewers, including a number of depressed sewer sections, often referred to as "inverted siphons."

A "Summary of Operating Data" is printed in the three accompanying tables:

Some Operating Notes

Grit Chamber:—For average conditions, the grit collectors are oper ated 4 hours per day.

Some trouble was experienced during the very cold weather with the freezing of the screw conveyor. Although electric heating elements were provided within the conveyor enclosure, insufficient heat was generated to prevent freezing.

Incinerator:—The incinerator has been used only a few times for the destruction of screenings. For average quantities of screenings it has been found much cheaper, and more convenient, to place the screenings in cans and then bury them in the tidal meadows adjacent to the plant. For peak quantities of screenings, the incinerator is too small to take care of the load, and again the "can" method of handling must be resorted to.

It is probable that the incinerator will prove very helpful when the *average* load becomes sufficient to

Table 1.—Summary of Operating Data (July, 1937, to April, 1938)

Month	Sewage Treated m.g.	Maximum Daily Flow m.g.	Minimum Daily Flow m.g.	Average Daily Flow m.g.	Average Daily Flow per capita gal.	Total Rainfall in.	Power Used k.w.h.	Power Cost per m.g.	Chlorine Used lbs.	Average Chlorine Dosage ppm.	Operating Cost	Operating Cost per capita	Operating Cost per m.g.
July	169.89	8.10	4.25	5.48	139	*	16,300	$1.90	9,810	6.9	$3,250.58	$0.083	$19.16
Aug.	227.96	17.18	3.97	7.35	186	7.84	20,160	1.73	11,470	7.2	2,875.13	0.073	12.60
Sept.	192.28	11.80	4.92	6.43	163	3.39	16,720	1.86	10,085	6.4	2,969.35	0.076	15.45
Oct.	189.55	12.10	4.30	6.11	154	4.67	17,200	1.90	14,380	9.1	3,279.00	0.084	17.30
Nov.	251.02	22.88	5.15	8.37	212	5.04	21,040	1.57	1,240	7.7	2,607.32	0.067	10.40
Dec.	262.30	12.63	7.12	8.48	215	1.37	23,280	1.68	0	..	2,692.40	0.069	10.25
Jan.	310.88	27.73	6.43	10.00	255	3.76	26,240	1.54	0	..	2,908.94	0.075	9.38
Feb.	310.74	16.31	8.61	11.10	236	2.71	26,480	1.46	2,080	**	2,618.33	0.056	8.40
Mar.	388.07	20.51	10.22	12.50	210	2.80	31,680	1.30	0	..	2,881.80	0.048	7.22
Apr.	363.74	19.60	8.12	12.12	204	2.49	28,240	1.30	0	..	2,742.66	0.046	7.02
Average	266.64	16.88	6.31	8.79	197	3.67	22,734	$1.62	....	7.5	$ 2,882.55	$0.068	.....
Totals	2,666.43	....	...	...	...	*34.07	227,340	....	49,065	..	$28,825.51	$0.677	$10.85

*No records obtained; 9 month total.
**For odor control and equipment adjustment.

Table 2.—Quantity and Type of Materials Removed from Sewage (July, 1937, to April, 1938)

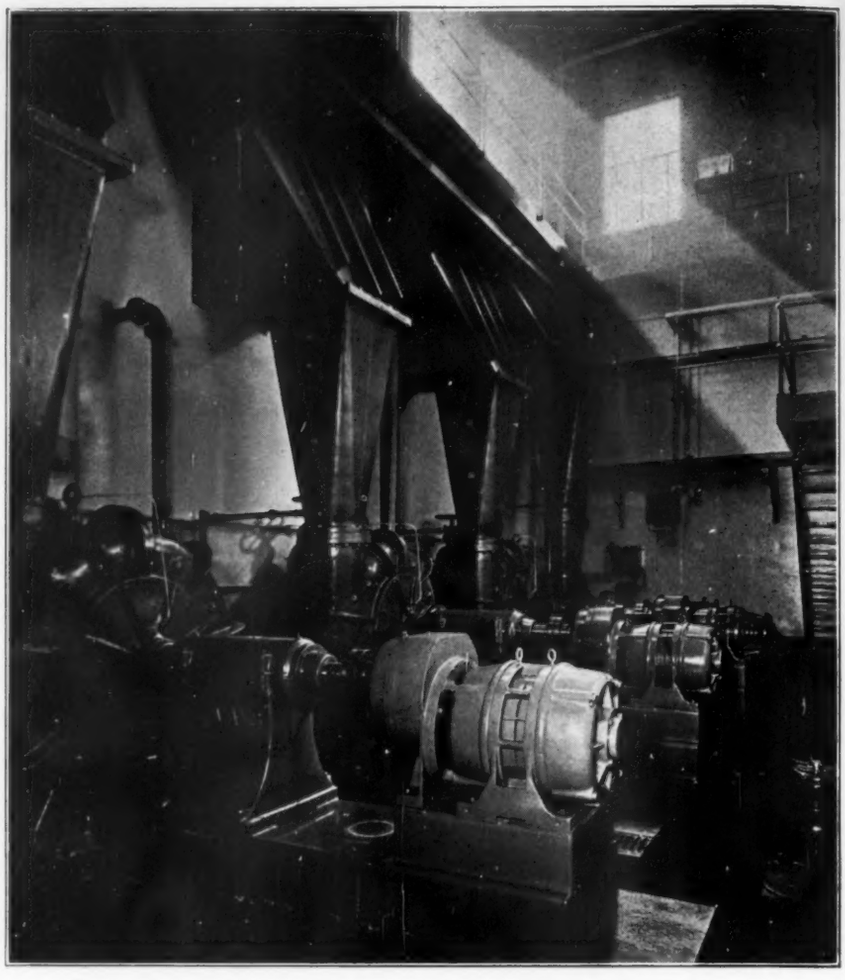
			Suspended Solids Removed						Biochemical Oxygen Demand			
Month	Sewage Treated m.g.	Total Suspended Solids in Raw Sewage* tons	Grit tons	Screenings tons	Grease tons	Solids Removed by Settling Tanks tons	Total Removed tons	Reduction %	Raw Sewage tons	Effluent tons	Reduction %	Daily Fresh Water Equivalent** m.g.
July	169.89	145.5	2.2	0.4	0.6	104.0	107.2	74	90	61	32	24
Aug.	227.96	179.4	10.0	0.8	1.0	124.6	136.4	74	68	43	37	21
Sept.	192.28	147.3	6.6	0.5	0.7	105.8	113.6	77	106	74	30	27
Oct.	189.55	153.9	7.6	0.8	0.9	102.8	112.1	73	88	41	53	39
Nov.	251.02	137.9	9.0	1.3	0.9	87.2	98.4	71	121	59	52	54
Dec.	262.30	114.1	7.6	1.8	1.1	73.7	84.2	74	108	57	49	46
Jan.	310.88	178.4	4.2	1.9	1.5	103.6	111.2	65	144	75	43	52
Feb.	310.74	150.0	8.2	5.C	1.6	81.9	96.7	65	102	70	31	30
Mar.	388.07	208.0	18.0	5.4	1.8	109.1	135.3	64	140	98	30	35
Apr.	363.74	206.5	16.5	3.2	1.6	118.4	139.7	68	110	66	31	38
Totals	2,666.43	1,621.0	89.9	21.1	11.7	1,011.1	1,134.8	70	1,077	644	40	..
Pounds per mg.		1,210	68	16	9	760	850	..	808	485	..	..

*Dry Basis, including suspended solids, grit, screenings and grease.
[**Understood to be that volume of clean, fresh water which would have been required in satisfying the oxygen demand removed by the plant, should such oxygen demand have had to be supplied through dilution. We do not believe, however, that this is a sufficient picture of the benefits of settleable solids removal, when it comes to improving sluggish water courses.—ED.]

warrant the expense of a full-time attendant at that point. However, improved ash-handling facilities will be required to make the operation of the incinerator practicable.

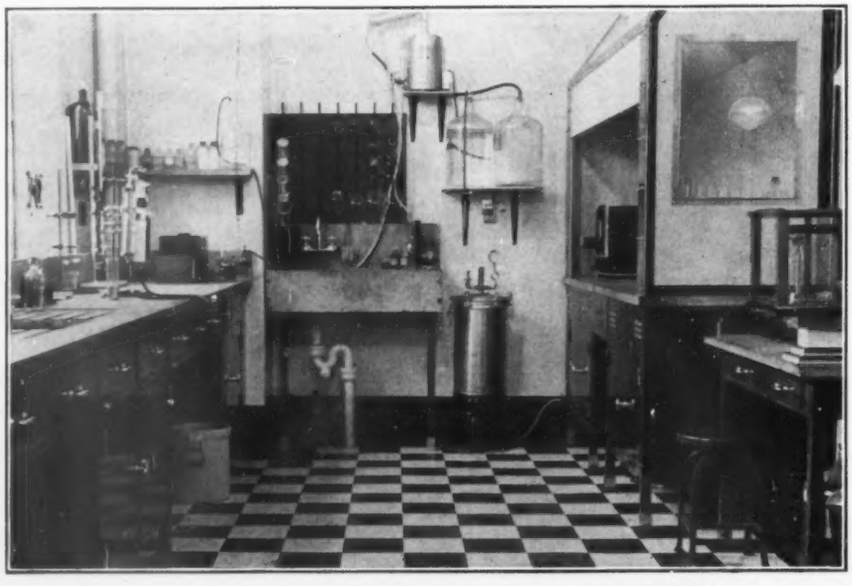
Chlorination: — Chlorine demand tests were run daily from August to November in an effort to correlate periodic variations in the strength of sewage with pre-chlorination dosages required to produce a residual in the plant effluent. The accompanying chart shows the results of this work, and indicates the very definite relation between the suspended solids load (strength of sewage) and the chlorine demand of the sewage. It has proved a simple matter to translate the chlorine demand for a ten-minute contact period in the laboratory to the current period of sewage detention in the settling tanks, recalling that prechlorination alone is employed.

Sludge Digestion:—This would be a strange plant indeed if sludge digestion difficulties were not encountered. Our chief difficulty has been in the continuous procurement of sufficient supernatant liquor to allow its routine withdrawal to provide the required space in the tanks for the incoming raw sludge. For long periods the supernatant has been of high quality, less than 1000 p.p.m solids, then for no apparent reason the zone of demarkation of supernatant disappears entirely, making it necessary to resort to too-frequent sludge withdrawals in order to handle the solids load. Unfortunately, the plant design provides only one outlet for the supernatant liquor, namely, into the settling tank influent channel. Discharging a heavy supernatant at this point is like a man trying to lift himself with his own boot straps; the heavier the supernatant, the greater the quantity of sludge to be pumped into the digesters. And the method may be found to result in other operating disadvantages, such as seeding the settling tanks with oxygen depleting and sulphide producing organisms. It definitely throws a heavier load on chlorination.



The Pump Room at Rahway.—Note the artistic lighting effect.

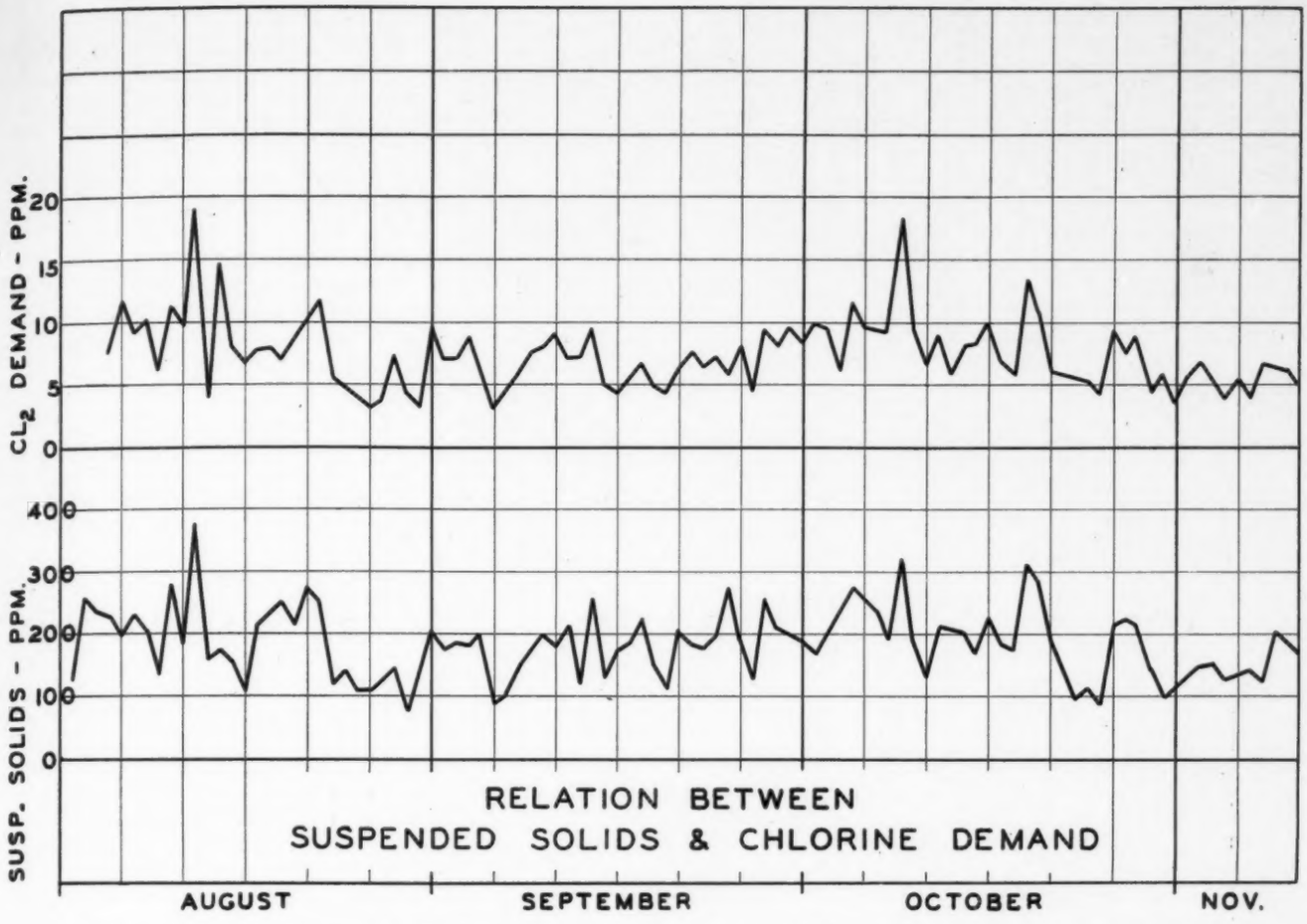
Four of the five units doing "Yeoman's" duty lifting crude sewage at the rate of 14 m.g.d. Note the velocity-reducing discharge arrangement terminating above channel flow elevation, making it permissible to leave out check valves.



One End of the Laboratory Rahway Valley Plant.

The temperature of the primary digesters is maintained at about 85 deg. F, and the secondary digesters at about 75 deg. F. The reaction of all digesters is held at pH 7.2 by the addition of milk of lime. We have found "Kemikal" lime, a product of the U. S. Gypsum Company, much more satisfactory than common masons' lime. It not only disperses more readily, but is also more active chemically, requiring much smaller dosages, than other limes, for a like adjustment of pH value.

It will be noted from Table 3 that the quality of the digesting sludge, as indicated by the solids determinations, improved steadily until October and November, after which the per cent of total solids in the secondary tanks gradually declined and the per cent of volatile solids in both



Relation Between Suspended Solids, Strength of Sewage and Chlorine Demands of Rahway Valley Sewage.

the primary and the secondary tanks gradually increased. The probable reason for this condition lies in the fact that during the first few months of operation there was more than ample digestion capacity. As the quantity of sludge in the tanks became more and more equal (in volume at least) to the designed capacity, the quality of the digesting sludge approached a level consistent with the ratio of the amount of sludge being handled and the designed capacity of the digesters.

Before the plant was placed into operation, the digesters were filled with settled sewage, and the temperatures brought to about 85 deg. F. At the same time, the pH of the tank contents was adjusted to 7.3 with milk of lime. After the above conditions were obtained, operation was commenced, and raw sludge was added to the primary digesters. Combustible gas was obtained in three weeks, and in four weeks auxiliary fuel was dispensed with and the entire heating plant was changed over to gas operation. It has been operated on sludge digestion gas ever since.

Gas Production: — Weekly analyses of the gas are made in the laboratory, using a Williams' gas analysis apparatus with an explosion

Table 3.—Summary of Sludge Digestion and Sludge Disposal Data (July, 1937, to April, 1938)

Month	Wet Sludge to Primary Digesters cu.ft.	Lime Added lbs.	Average Digester Temp. Prim.	Average Digester Temp. Sec.	Gas Production* 1,000 cu.ft.	Heat Value of Gas B.t.u.	Digested Sludge to Drying Beds cu.ft.	Dried Sludge Removed from Drying Beds cu.ft.	Sludge Analyses — Raw Sludge — % Total Solids	Sludge Analyses — Raw Sludge — % Vol. Solids	Sludge Analyses — Digesting Sludge — % Total Solids Prim.	Sludge Analyses — Digesting Sludge — % Total Solids Sec.	Sludge Analyses — Digesting Sludge — % Vol. Solids Prim.	Sludge Analyses — Digesting Sludge — % Vol. Solids Sec.
July	100,851	18,850	87	77	....	505	22,755	0	5.2	68.7	..	5.7	...	51.9
Aug.	86,197	0	87	79	....	561	50,948	639	6.1	68.3	..	5.0	...	47.7
Sept.	79,721	1,750	87	78	....	581	21,423	1,104	6.0	69.2	..	6.7	...	44.6
Oct.	77,545	0	87	75	....	580	27,185	2,416	5.7	72.5	..	7.6	...	44.8
Nov.	74,905	1,900	86	73	....	600	26,750	990	4.8	73.3	8.9	6.7	44.0	45.1
Dec.	91,748	19,000	84	72	....	573	38,235	4,840	5.4	74.4	3.4	5.5	49.3	46.3
Jan.	85,167	15,500	85	71	1,530	584	50,940	4,920	4.4	74.2	3.5	5.5	51.9	46.9
Feb.	84,976	16,500	87	68	1,379	604	46,033	5,040	3.8	76.3	3.1	5.2	52.1	48.0
Mar.	93,181	18,500	85	74	1,783	580	51,234	4,844	4.8	73.2	3.1	4.5	54.8	51.0
Apr.	89,687	0	87	82	2,009	600	28,648	4,627	5.5	72.7	3.0	4.5	54.7	51.0
Daily Aver.	2,550	.....	86	74	56	577	1,190	96	5.2	72.3	3.2	5.7	51.1	47.7
Totals	774,291	92,000	..	..	*6,701	...	364,151	29,420	..	...	..	..	...	...

*Total Gas Production was not measured until January 1, 1938.

Distributing Channel
Receiving the discharge from one of the 14 m.g.d. pumps.

Table 4.—"Gas Production"

	Jan.	Feb.	Mar.	Apr.
Gas Production, 1,000 cu. ft.	1,530	1,379	1,783	2,009
Aver. Heat Value of Gas, B.t.u./cu. ft.	584	604	580	600
Pounds Volatile Solids Added	176,500	156,000	205,000	222,000
Cu. ft. Gas per capita per day	1.27	1.05	0.96	1.01
Cu. ft. Gas per lb. vol. solids added	8.7	8.8	8.7	9.1
B.t.u. value per lb. vol. solids added	5,080	5,310	5,030	5,460

burette. The average of all analyses run to date is as follows:

Carbon Dioxide, CO_2	= 31.7%
Methane, CH_4	= 53.8%
Hydrogen, H_2	= 6.1%
Oxygen, O_2	= 1.0%
Nitrogen, N_2	= 7.4%

Accurate measurement of the gas produced was not possible during the early stages of operation, due to adjustments required in the gas collection system. A summary of data pertaining to gas production for the first four months of 1938 is given in Table 4.

Gas Utilization:—At the present time an exhaustive study is being made of the economics of gas engine electric power generation for the Rahway Valley Plant, using sludge digesting gas as fuel. Preliminary conclusions indicate that (1) Sufficient gas is being produced to generate power for all normal and peak demands; (2) Sufficient heat is recoverable from the jacket cooling water and exhaust gases to heat the digestion tanks, the service building, the administration building and the garage. (3) A net savings of about $2,000.00 per year can be effected as compared with our present power costs of approximately $5,500.00 per year.

[In a forthcoming paper Mr. Wittwer will discuss the basic factors to consider in studying the economics of power generation at sewage treatment plants. His analysis results from the author's recent careful investigations into the merits of engine-generator sets for primary treatment plants, wherein power costs are not of such consequence as in activated sludge plants.—ED.]

COMPRESSED AIR SUPPLY AT LITTLE COST

Available to Every Water Taker— A Real Kink

By W. F. SCHAPHORST, M.E.
Newark, N. J.

SO FAR as this writer knows, no effort has ever been made by any water utility to show customers how easy it is to utilize water supply to produce compressed air. Hence it is thought that the accompanying sketch might prove interesting. It shows how anybody can provide themselves with compressed air without the use of a pump or any other equipment aside from a simple "pressure container" of some kind.

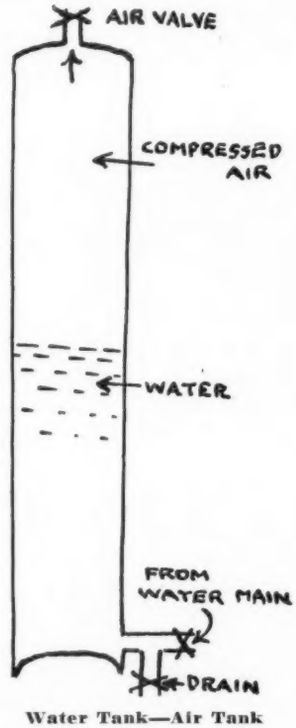
Every once in a while there is an emergency need for compressed air, and the usual way is to go helplessly without it because there is no air compressor readily available. But in most cases, by exercising a little ingenuity, as shown here, compressed air will be obtainable with little expense and a simple "compressor" which operates without power or lubrication.

The sketch shows how any ordinary water tank can be utilized. It will serve the purpose very nicely, provided it does not leak. The method of operation is simple, as follows:

Close the "air valve" at the top and allow water to enter at the bottom. When the trapped air attains the same pressure as the water in the city water main, the inflow of water will cease, of course.

The compressed air above the water can then be used for any purpose such as paint spraying, filling automobile tires, bicycle tires, dusting, blowing scale or dirt out of pipes or radiators; spraying plants, operating a humidity atomizer, or anything else; starting diesel engines, cleaning smoking pipes, etc.

As soon as the tank is full of water, close the inlet valve, drain the water out, and repeat the process.



Water Tank—Air Tank

Instead of junking rusted out hot-water tanks these may be patched, or reinforced with wrapping felt and tar, and set up in the basement, garage, or shop, as air "compressors." And there are 101 uses for compressed air. It can even be used to play Bob Burns' "Bazooka."

NEW ENGLAND WATER WORKS ASSOC. DEVOTES AFTERNOON TO STEEL PIPE

Forenoon to Water Works School and Round Tables

THE New England Water Works Association held its December meeting in Boston on December 15.

As has been customary in recent years, the first hour was devoted to the Water Works School, this year's series of lectures being given by Thomas R. Camp, Associate Professor of Sanitary Engineering, at the Massachusetts Institute of Technology.

"Hydraulics of Distribution Systems" was the topic on which PROFESSOR CAMP lectured. His discussion was devoted to divided flow of water through pipe loops in distribution systems, involving two or more branches fed from an arterial main. The mathematical solution of the question of attainable volume of flow and residual pressures at various points, in designing new systems or evaluating existing systems, is considered to be one of the most difficult problems in water supply engineering. Professor Camp, here pictured in the act of explaining the complex formulas and many factors and assumptions involved in solving a relatively simple problem, discussed three methods: (1) The Freeman Method; (2) The Electric Analyzer Method; (3) The Hardy-Cross Method. Method No. 3 he explained in considerable detail, since it is currently the preferred method amongst engineers. (The method is presented and explained in Engineering Bul. No. 286 of the University of Illinois.—Ed.) The Freeman Method, he said, had the disadvantage of being less direct. Then Professor Camp went into a discussion of his own Electric Analyzer Method. It involves the calculation of relative resistances of the several mains constituting a loop and, thereafter, setting up an electrical loop system into which resistance boxes (coils) are inserted to simulate the ratios of calculated water flow resistance. Then, with given current flows entering the simulated "grid-iron" of electrical resistances, the percentage of the whole current which passes through each unit of the system is measured simultaneously to reveal the expected behavior of a water main system, as designed, under changing flow demands at various points of takeoff.

Professor Camp cited some typical examples of water flow analysis on two systems. The difficulty of producing a balance, at the end, was revealed in the fact that his students had made 8 separate traverses of one relatively simple water system serving only 12,000 population (62 loops and 161 elements) and no balance had yet been procured.

Geo. A. Sampson
President of
N.E.W.W.A.

In his opinion, the Electric Analyzer Method seemed to offer the greatest promise, in respect to reliability in predicting the performance of water main systems as designed. Work at M.I.T. in the direction of simplifying the method, which at present involves the adaptation of vacuum tubes as resistance elements, is proceeding under the direction of Professor Hazen.

Prof. Camp at Work

Superintendent's Round Table

Chairman, ALAN F. MCALARY, Supt.

Topic No. 1— Leaks—Their Detection and Location

In introducing this topic, Chairman McAlary stressed the difficulty of effectively locating so-called "hidden leaks," and those "tricky leaks" which travel considerable distances under ground along the pipe line before breaking through as visible leaks. He emphasized the necessity for prompt action when a leak is reported. Especially important was it to a privately operated water utility to "get going" with minimum delay. He advocated "making motions" at the outbreak of the leak, to satisfy consumers and the public, while the reported leak was actually being traced in as systematic a manner as possible. The fact that an air drill was promptly put to work seemed to satisfy the public that something was being done about the matter.

Mr. McAlary cited an interesting case of one hidden leak which drained a frozen reservoir while the top ice held and water works employees had not suspected that mostly air and but little water was under that ice sheet. A case of the opposite nature involved reporting of sudden pressure drop indicating a serious leak, but it proved only to be a frozen line to the gauge. Calling for leak experiences and methods of location, from various members, yielded the following information:

HAROLD W. BRIGHAM, Supt. of Water and Sewerage, Marlboro, Mass., reported the watching of night sewage flows to detect any important hidden leaks. Leaks were traced by use of geophones on fire hydrants.

ROGER G. OAKMAN, Supt. of Water, said that in Needham, Mass., they had found that sectionalization of the distribution system, by closing valves during the night, and taking flow or pressure drop records, to be the most satisfactory scheme for tracing down leaks.

MILTON THORNE, Supt of the Portland (Me.) Water District, said that leaks were traced under paved streets or frozen ground, or up steep slopes, by drilling a series of holes along the main.

HORACE J. COOK, Supt. of Water and Sewerage, Auburn, Me., told of his experience of drilling through a telephone cable while so tracing a leak 200 yards from its point of entry into a cellar. He cited an interesting experience with a leak through the bonnet of a 50-year-old valve. The value of constancy in design of water works equipment was

illustrated when it was found that the bonnet and disc from a 1938 model of this same make of valve fitted the 50-year-old valve perfectly.

ROGER W. ESTY, Supt. of Water, Danvers, Mass., reported that they had in one instance located a leak 1 mile away from the point of its outbreak. As a routine survey they had practiced zoning of the system by valve closures and then bypassing the flow into the section around the valve through 24-hour recording meters. They had found that this method had yielded much worthwhile information in addition to leak and waste detection. In one case a hidden leak when corrected had resulted in the drying up of what had previously been considered a spring-fed swamp. One of the most baffling leaks proved to be through a "hidden" connection and valve between a line and an abandoned industrial supply main.

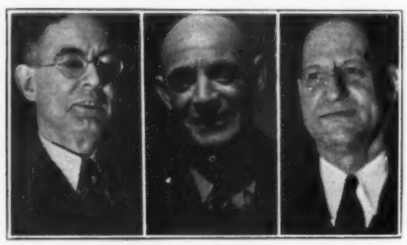
HENRY T. GIDLEY, Supt. of Water, Fairhaven, Mass., reported the practice of disconnecting at the curb cock whenever a service line was to become dead for an indefinite period, or was to be permanently abandoned. He cited an experience wherein a water curb cock had been partly opened by a gas utility employee through mistake. This "hidden" leak had long been responsible for a wet cellar and greater income to the electric utility supplying current to the pump motor. For the estimated value of wasted water "Super" Gidley billed the gas company, fought over the claim, settled for 50 cents on the dollar. Moral—Disconnect all abandoned services at the curb cock.

Chairman McAlary called for experience in locating and correcting leaks in river crossings and other sub-aqueous lines. A member replied that he had no first hand leak experience to offer, but had heard of the satisfactory use of large diameter rubber hose (up to 8 in. diameter) for stream and salt marsh crossings, the coupling being of U. S. Navy bronze and the hose lines connecting to the cast-iron main on either side of the crossing. The interesting aspect was the ease of installation and inspection, the latter after 8 years of service having shown no deterioration of rubber line or bronze couplings.

Alan F. McAlary, Rockland, Me. (Handled Supt.'s Round Table)
"Sid" S. Anthony, Augusta, Me.
Jas. J. Dillon, Providence, R. I.

Topic No. 2—
Markers for Hydrants, Gate Valves and Boxes

The Chairman called on Nelson Boardman, Asst. Supt. at Danvers. Mass., to describe the type of markers used by Danvers on telephone poles. Mr. Boardman passed around a sample, which was a neat wooden block about 4x5 inches painted black. On it numerals appeared. These aluminum numerals, purchased at hardware or 10-cent stores, were tacked on and sprayed with orange colored Duco enamel. The upper number (in this case 37) signified a gate valve 37 ft. down the line of poles. The lower number (in this case 14) signified 14 ft. out from pole line, at right angles. The markers are placed above arm reach on the poles.



Sherman Chase, Boston, Mass.
Nelson Boardman, Danvers, Mass.
Leland Carleton, Springfield, Mass.
(Vice-President of N.E.W.W.A.)

HOWARD M. KING, Supt. of Water, Springfield, Mass., stated that they used slender concrete posts, extending 4 ft. above ground, with distances stamped into the concrete. They had been significantly free from damage by children or others.

HAROLD W. GRISWOLD, Deputy Chief Engineer, Metropolitan Water District, Hartford, Conn., reporting poor experience with telephone pole markers, said that they now use two lengths of painted pipe driven down on opposite sides of roadways. Distance out on the line (marker to marker) is shown on the marker nearest the valve, etc.

S. S. ANTHONY, Supt. of Water, Augusta, Me., called attention to a marker for rural sections, which consists of a flexible coil-spring that attaches vertically to the hydrant and extends 4 ft. above it. A cloth flag is on upper end. Based on satisfactory experience with such markers at Belfast, Me., he expected to use them in outlying districts of Augusta.

A member reported that in England markers of angle iron, with a plate similar to an automobile plate, show exact distances to gate valves and fire hydrants that are in pits below street level. In Pittsfield, Mass., posts of marble are employed with distances cut in. Distances to hydrant gates are stamped on the hydrant barrel.

Two Secretaries—Guest and Host
Harry Jordan of A.W.W.A.
Frank Gifford of N.E.W.W.A.

*Chemists' Round Table**

Chairman E. M. BATTEY, Chemist, Water Dept. of Providence, R. I.

Topic—
Sampling, Analyses and Keeping of Plant Records

Mr. Battey opened the discussion with a description of sampling methods and analytical schedule of the Providence Filtration Plant Laboratory. Routine plant samples, together with those collected from the reservoirs and distribution system, total 29,000 tests yearly. Such extensive sampling and analytical program makes possible a constant record and study of water quality from the water-shed to the consumer's tap.

The value of analytical control for small water works was also emphasized. This feature, so often neglected in smaller plants, required relatively inexpensive apparatus, and the simpler tests could be demonstrated to plant operators.

J. J. DILLON, Asst. Engineer, Rhode Island State Health Department, described the efforts of the State Health Department of Rhode Island to promote scientific control of small plants. In this direction standards and solutions for analytical work are provided by the department for plants which do not have technically trained personnel.

PROF. E. W. MOORE, Harvard University, expounded on the need of regular bacteriological examinations of all water supplies, and the potential danger which exists with inadequate control of water quality.

*For this report covering the Chemists' Round Table we are indebted to Fred E. Smith, Chemist, Water Dept. of Cambridge.

Chemists
E. M. Battey, Providence, R. I. (Handled Chemists' Round Table)
Prof. E. W. Moore, Harvard Univ.
Fred. E. Smith, Cambridge, Mass.

Mr. Battey exhibited record forms used at the Providence Filtration Plant. The number of record forms had been gradually reduced, in order to simplify the plant records and those kept at the city hall. Daily, weekly and monthly reports are prepared under the new schedule.

Technical Session

(PRES. GEO. A. SAMPSON Presiding)

Immediately following luncheon the program was devoted to papers on experiences with recent New England installations of steel pipes, following which a moving picture revealed methods of fabricating, coating, lining and installation of steel pipes.

"The Use of Lined and Wrapped Steel Pipe by the Augusta Water District," by SIDNEY S. ANTHONY, Supt. and Engineer, Water District of Augusta, Me.

Mr. Anthony briefly described the Augusta system and thereafter presented recent (illustrated) experiences with the installation of a 4000 ft. main extension, involving 8 in. steel pipes in 40 ft. lengths connected with Dresser couplings. The pipe was fabricated by the Youngstown Sheet and Tube Co. and coated, lined and wrapped by Hill-Hubbel Co. of Cleveland. With the aid of splendid pictures of construction progress, Mr. Anthony described the project, which was financed out of impounded operating profits at a cost of $10,451 for the 4000 ft. main, and $400 for valves and hydrants. The completed project, including a miniature standpipe, ran $12,385. The pipe proper cost $1.05 per foot. Flanged valves and hydrants were connected to the main with half-Dresser couplings; services (1 in. copper tubing and 2 in. steel pipe) were made with Mueller's strap-type saddles of malleable iron; all pipes being laid on blocks and tamped. Mr. Anthony pointed to the advantages of the long lengths of pipe, the ease of handling, laying and jointing with the type of couplings employed.

"Laying Lined and Wrapped Steel Pipe at Needham, Mass." by ROGER G. OAKMAN, Supt. of Water Department, Needham, Mass.

Mr. Oakman described the new steel transmission main of Needham, Mass., involving 3400 ft. of 14-inch Youngstown pipe, in 40 ft. random lengths, lined, coated and wrapped by the Hill-Hubbel Co. process in the Youngstown mill. Since only 800 ft. of the line was straight, many special bends were needed. However less of such had been required because of the joint deflection tolerances of as much as 4 degrees, which use of Dresser couplings had made possible. Pipes were coupled while supported on wooden horses across the trench and then lowered. An interesting phase was the ease and economy of handling the light weight (¼ in. wall) from cars to trench side. At 15 lengths of the 14 in. pipe per load (40 ft. each), the cost of handling proved less than 5 cents per foot.

Corrosion Control

The Determination of Chemical Dosages to Prevent or Subdue Corrosion by PROF. EDWARD W. MOORE, Graduate School, Harvard University.

"Supers"
"Don" Calderwood, Nashua, N. H.
E. A. Merrithew, Sangus, Mass.
George Merril, Ware, Mass.

Professor Moore described a corrosive water as "a calcium carbonate hungry water." Therefore, anti-corrosion treatment with lime, caustic-soda, silicate of soda (for very soft waters combinations of these) was being applied to raise alkalinity and pH value of such waters to render them non-aggressive toward marble or limestone and, in turn, passive toward metals. The most commonly employed control test had been the so-called marble test, which involved adding powdered calcium carbonate to a sample of the water and determining the degree to which the carbonate is dissolved by the water. This test Prof. Moore outlined in some detail, pointing out its deficiencies in respect to time required, etc. Then he explained a preferred method, which constituted a simplified modification of that suggested by Professor Langelier of the University of California for calculating the degree of aggressiveness of waters when the calcium content, alkalinity, pH value, temperature and dissolved solids is known for the particular water. The suggested method, and its application in treatment control, was illustrated by graphs on the screen.

In applying lime for corrosion prevention, Prof. Moore pointed out that frequently too heavy a deposition of calcium carbonate in the mains and services near the plant had been experienced, while at remote points on the system protection had been inadequate. To prevent this undesirable condition, he recommended treating to a point where either the marble-test or the Langelier Index indicates some degree of undertreatment. Lantern slides were used to illustrate this and other points covered. For greater details, Professor Moore referred his listeners to his recent paper on the same topic that has appeared in the September 1938 issue of the Journal of N. E. W. W. A.—see pp. 311-317.

ROBERT SPURR WESTON, Consulting Engineer (Boston), agreed with Professor Moore that it was better to hold to middle ground in treatment to subdue corrosion for more reasons than one. In addition to creating deposits in meters and services there was the likelihood of complaints of taste from lime or caustic treatment to be considered.

To correct an attack on lead services Mr. Weston cited the interesting case at Attleboro, Mass., where lead poisoning had been experienced. Examination disclosed 8 p.p.m. of lead in solution at certain points on the system. Since anti-corrosion treatment had been instituted the content of lead had gradually been diminishing, the latest figures showing but 0.035 p.p.m. lead, although the water had not been treated to complete calcium carbonate saturation. In this instance (and another case cited) the trouble had been caused by joining lead service lines to copper tubing, thus forming a so-called electrolytic couple of dissimilar metals,

Edw. Wright, Mass. Dept. of Health
Arthur Miller, U. S. Pub. Health Service
Philip Harrington, Mass. Dept. Health

whereupon the lead went into solution.

Asked if hexa-meta-phosphate treatment, along with the lime, would not prevent deposition of calcium carbonate, Mr. Weston replied that he had no first hand experience with the method, but that reports from the middle-west had indicated marked possibilities for this material, which was being produced under the trade name "Calgon." (On this development there is to be found an article by C. P. Hoover and Owen Rice elsewhere in this issue.—Ed.)

In reply to another question, Mr. Weston said that silicate of soda had been used in combination with lime at two New England plants. The interesting point was that its use need be only intermittent, one day of application out of 7 to 10 days of continuous lime treatment having proved sufficient. Apparently the silicate produced a film on the pipe walls which lasted a week or longer when lime was being employed to all but completely satisfy the "calcium hunger" of the water. The scheme had proved both practical and economical, avoiding the necessity of over-treatment with lime with the undesirable consequences already referred to.

E. M. BATTEY, Chemist, Water Department, Providence, R. I., stated that fermentation (CO_2 production) in dead ends had proved responsible for exaggerated corrosion in outlying portions of the system at Providence and elsewhere. Lime treatment alone for such conditions would have doubtful if any value. Dead-end bleeding to waste at a steady rate had been employed as the solution at Providence.

L. H. ENSLOW, in discussing Professor Moore's simplification of the

Two Supts. and a President
A. W. Read, Bangor, Me.
George Bean, Exeter, Mass.
Alan L. Bird, Rockland, Me.
(Camden & Rockland Water Co.)

Langelier method of evaluating anti-corrosion treatment, complimented both professors on scientific contributions, but thought that in general the marble test was still the more practical for small plants and for all plants experiencing frequent water quality changes. He agreed that the present methods of performing the so-called marble-test were open to criticisms as to exactness, and required too much of the operator's time to be practical as a daily routine control test. So, to avoid use of equations requiring analytical determinations (completed only after the water may have changed in nature appreciably) and to make it possible to determine the Langelier Index, and simultaneously to evaluate the marble test at any minute of the day or night, Mr. Enslow suggested the scheme of running the treated water continuously upwards through a tube filled with precipitated chalk or marble dust, and upwards through a second "trap-tube" filled with marble or limestone chips. As frequently as desired a simple pH determination or titration of "in and out" samples of the water passing through the "Stability Indicator" would, by subtraction, reveal the Langelier Index. In addition, how far the calcium carbonate hunger of the water had been satisfied. There would be no manipulation or time required in preparing samples—no wearing out of constant tables and slide rules; no time consuming chemical analyses to be made; no temperature and solids corrections to apply.

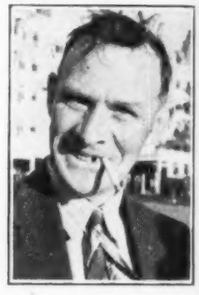
In reply to a question as to the dependability of the scheme, Professor Moore replied that the method outlined would reveal the "Langelier Index" all right. In addition, the marble-test "index" is obtained simultaneously.

Where It Had to Be Lugged In.
Laying 40-ft. Lengths of Steel Pipe in Some Rough Going at Augusta, Maine.
(Anthony)

"Water, Water Everywhere!" But Not a Drop at the Kitchen Sink

(A Believe-It-or-Not Story)

Here is what's believed to be a most unusual story. It is news, of the "Man Bites Dog" variety.



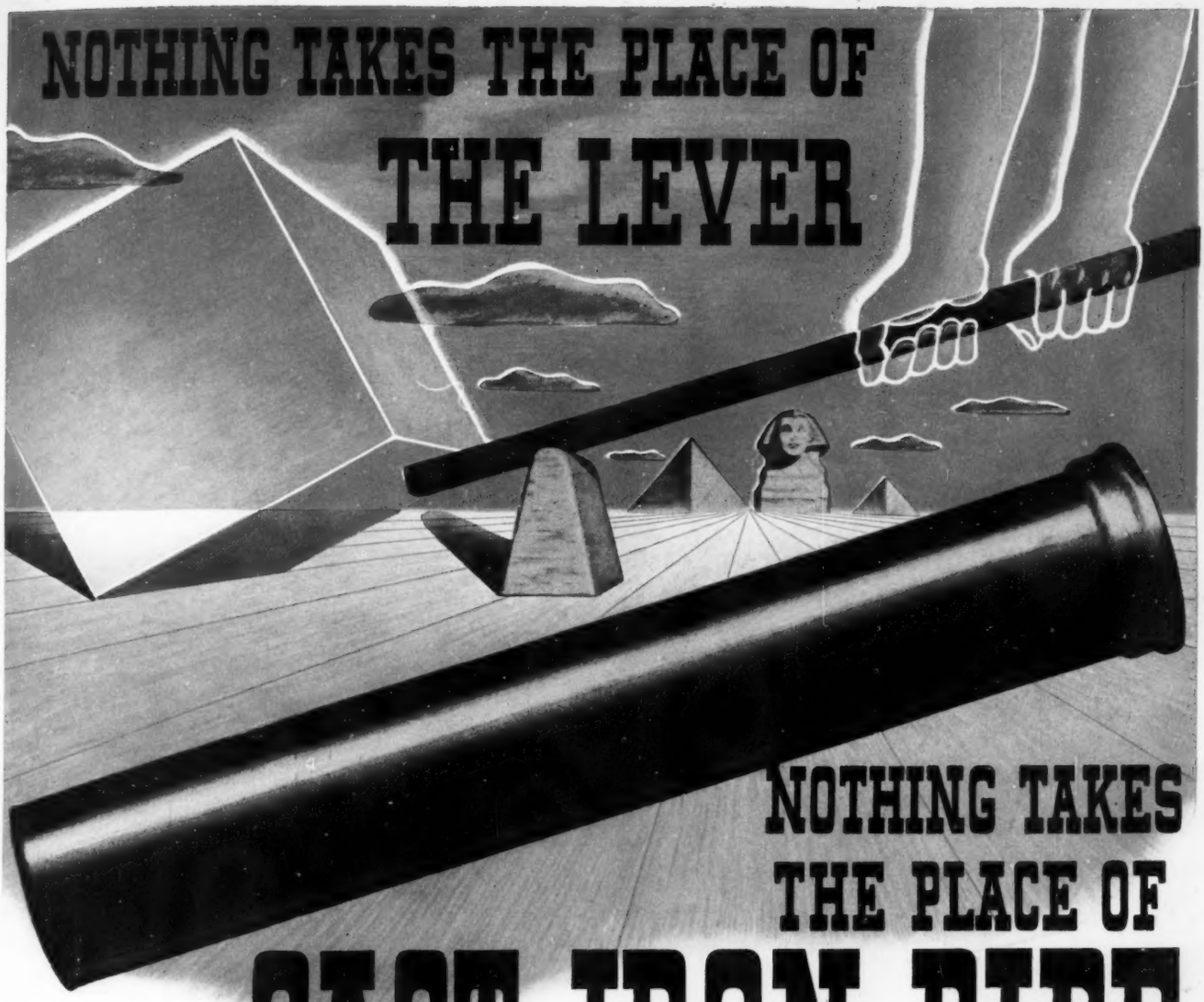
"Scotty"

Believe - it - or - not, there is at least one water works "Super" who lives in a house *without water*. We discovered him during a recent water works meeting and here's his picture. Does he give a dern? Well, just look at him. Plumbers, take note—"we give you" Scotty Marshall, Superintendent of Water at Georgetown, Mass. But, please don't burn him at the stake, because he's a very useful citizen around Georgetown.

Brother Marshall is a "first class" member of the New England Water Works Association (has been since 1935), and his full name is William James Caird Marshall. The Georgetown water main runs only a few feet away from his home but he will have none of it. Why? Well, that's William James Caird's secret—they call him "Scotty" in N.E.W.W.A., but he smokes "tailor mades," and he comes to meetings, too.

What are they going to do about it? Well, rumor has it that a committee is to be appointed amongst neighbor members to investigate why charges should not be brought for behavior unbecoming a New England water-purveyor. With the fine collected, the committee proposes to go down to William James Caird's house (if they can keep him hog-tied that long) and pipe it with two kinds of water—*hot* and *cold*.

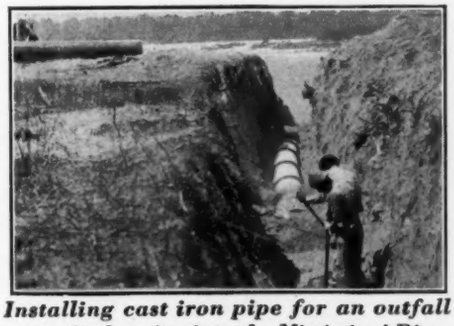
[Can any water works man match this stranger-than-fiction story? If so, let's have it.—Ed.]



THE LEVER and fulcrum as an engineering principle—cast iron pipe as a long-lived material for underground mains—nothing has taken their place for centuries. Yet both have been highly developed in design and efficiency.

If you demand *proved* long life and low maintenance cost that result from effective resistance to corrosion—assured safety margins for impact, beam load and crushing stresses—and permanently tight joints—then you will agree that *nothing takes the place of cast iron pipe.* Some materials meet some of these requirements but only cast iron pipe meets them all.

THE STANDARD MATERIAL FOR UNDERGROUND MAINS



Installing cast iron pipe for an outfall sewer discharging into the Mississippi River at Greenville, Miss. The requirements demanded a material with great crushing strength and effective resistance to corrosion.

Look for the "Q-Check" registered trade mark
Cast iron pipe is made in diameters from 1¼ to 84 inches.

THE CAST IRON PIPE RESEARCH ASSOCIATION, THOMAS F. WOLFE, RESEARCH ENGINEER, 1015 PEOPLES GAS BUILDING, CHICAGO, ILLINOIS

It Happened in Far A

THE CARBORUNDUM COMPANY

ABRASIVE AND REFRACTORY MATERIALS

NIAGARA FALLS, N.Y.

September 7, 1938

FRANK C. ROE, SALES MANAGER
POROUS PRODUCTS AND LABORATORY WARE

Mr. Linn H. Enslow, Vice-President & Editor
WATER WORKS & SEWERAGE
155 East 44th Street
New York, N. Y.

Dear Linn:

You will be interested to learn that we have recently received an order for 5200 sq. ft. of Aloxite Brand porous underdrain plates from the Singapore Water Department. A plant of 15 M.G.D. capacity is certainly no longer in the "small potatoes" class, even though many of the previous 25 installations of this system are good sized permanent installations.

This news will be particularly gratifying to you when I tell you that the initial inquiry from which the interest and ultimate design developed has been traced directly to WATER WORKS & SEWERAGE. Enough of the correspondence is attached to give you the complete story.

This experience, of course, is gratifying to me because it offers concrete evidence to justify our advertising program. Your own personal interest and the fine editorial support of our POROUS UNDERDRAIN SYSTEM development are likewise important factors of which we are equally appreciative.

The good reports received from all installations plus the prestige of this new Singapore job will now back up the outstanding qualities of the POROUS UNDERDRAIN SYSTEM and the benefits to be derived therefrom.

Yours very truly,
Frank C. Roe
Porous Products and Laboratory Ware Dept.
THE CARBORUNDUM COMPANY

FILE NUMBER

LPH.
SINGAPORE SWIMMING CLUB DEPT. No. 31

14th January, 1935.

The Filtration Dept.,
Carborundum Co.,
Niagara Falls,
N. Y.,
U. S. A.

Dear Sirs,

Having seen an article on R.S.F, aloxite plates in "Water Works and Sewerage" Vol. LXXXI No.11 of November 1934, I should be interested to receive further details. Please forward your Bulletin No.2. I would like to consider the use of these porous plates in place of sea water, upward flow filter which at present,

foot or per unit of R.S.F. aloxite

given quantity

Something New in Filter Bottoms

The most interesting development in rapid sand filter underdrain schemes since the Harrisburg type was developed, has been recently announced (WATER WORKS AND SEWERAGE for October) by the Carborundum Co. of Niagara Falls, N. Y.

Having been successful with their "Aloxite" air diffuser plates and tubes, employed in sewage and water-aeration, this company has experimented with and perfected an "Aloxite" plate of special porosity, which is offered as an underdrain plate for constructing bottoms for rapid sand filters and zeolite units. These plates are composed of fused, crystalline oxide of alumina.

The channels molded into the plate serve as laterals for air or water wash of the filter bed. The porous plate itself is the distributor—thus eliminating the neces-

r Away Singapore . . .

SELDOM does an occasion arise for a publication to present in such form the facts shown on these pages. Even more seldom is the evidence of the value of trade magazines so completely told as this story unfolds in a manner so factual.

For the opportunity to present this evidence of value, we acknowledge with appreciation the courtesy of the Carborundum Company of Niagara Falls, N. Y., and are grateful for its kindness and cooperation.

PURCHASE ORDER

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The Carborundum Company,
Niagara Falls,
New York. U.S.A.
Per Carborundum Company Ltd. Manchester.

Date. 12th August, 1938.

Please supply, subject to the Instructions and Conditions specified on back hereof:—

ITEM No.	QUANTITY or WEIGHT	DESCRIPTION	PRICE
		CONFIRMATION.	
		oxite Porous Plates - plain	Roun
		7/8" x 11.7/8" x 1.1/4" deep.	UK
		d strongly both for the material	
		he voyage.	
		or Lading, 3 stamped and 1 pla	
		be made out sea freight paid	
		ame or neutral name duly endor	
		ippers consigned to	
		One negoti	
		ll or Lading is to be forwarded by	
		carrying steamer addressed to the abo	
		consignee at Singapore, the remaining	
		documents to be presented here for pay	
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		or neutral name duly endorsed, in dupl	
		licate, upon W.P.A.terms, covering 10%	
		above the invoice value with claims	
		payable abroad.	
		The country of origin of the material	
		must be stated on the invoice.	
		It is essential that the plates have	
		permeability of 22 Imperial gallons	
		with loss of head of nine inches.	(CONTINUED)

In accordance with your — Terms of Payment:

Date of Shipment:

It is essential that the DATE OF SHIPMENT and NAME OF STEAMER be advised to the Shipping Department, Millbank, S.W.1. at least 7 days prior to despatch of goods.

5,200 PLATES

$

WATER ENGINEER'S DEPARTMENT,
Municipal Office.
Singapore
5th September, 1938.

Messrs. The Carborundum Company,
Niagara Falls,
N. Y.,
U. S. A.

Dear Sirs,

Referring to your letter of February 5th addressed to the Secretary of the Singapore Swimming Club, Singapore which I have been permitted to peruse, I should be obliged if you could let me have a rough sketch plan shewing the method used for connecting your Aloxite Brand RSF Underdrain Plates to the manifold.

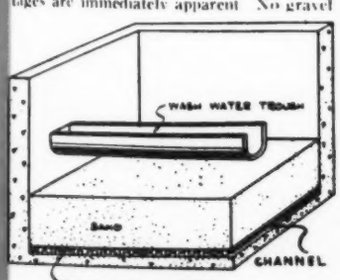
aquarium and I desire if possible to place the manifold outside the Filter Box. If however you manufacture special Plates for the manifold into which your ordinary R.S.F. Plates can be fitted and which will permit complete suspension of the sand over every unit area, then an external manifold will be unnecessary.

Yours faithfully,

DEPUTY WATER ENGINEER.

of the gravel bed and special air distribution piping within the filter. The advantages are immediately apparent. No gravel bed to become inverted and clogged, less depth of filter box required; no danger of bed "blow-ups" by water rush or trapped air; most effective uniformity of distribution of wash water and filtration ratios, no metal to corrode. The manufacturer guarantees permanence and less head loss due to friction than with previously accepted underdrain systems. With this new type of filter bottom it is possible to combine air and water wash where desirable.

"R.S.F." Aloxite plates are 11⅞ inches square and are bonded to the filter floor with high grade asphalt (phenol free) and the ¼ inch joints between plates are made of the same material. The Carborundum Co. maintains a special Sanitary and Filtration Department which has just issued Engineering Bulletin No. 2 on "Aloxite R.S.F." Underdrain Plates. For a copy, which gives detailed technical data, address Filtration Dept., Carborundum Co., Niagara Falls, N. Y.



Filter Equipped with Aloxite Underdrain Plates

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THE N. C. WATER AND SEWAGE WORKS ASS'N AT GREENSBORO

New North-Side Treatment Plant Featured

A Report by H. B. GOTAAS*
Chapel Hill, N. C.

THE North Carolina Section of A. W. W. A. and the North Carolina Sewage Works Association held their joint annual meeting in Greensboro, N. C., the birthplace of the Section, in 1920, on October 31, November 1 and 2. The more representative attendance of 240, as compared with the lower attendance of

Retiring President J. W. Kellogg

Incoming President Wm. M. Platt

the 1938 meeting held in August, confirmed the wisdom of returning to the policy of holding these annual meetings in the fall instead of summer.

In an inspiring address of welcome Mayor Roger W. Harrison pointed out that not alone does the community's well-being and health, but likewise does the industrial prosperity of a city depend upon proper water and sewage facilities. For the pronounced advancement in water and sewage practices, which had kept pace with the onward march of science, the Mayor was loud in his praise of engineers and chemists responsible.

AWWA's President Speaks

The Section was honored by the presence of the President of A. W. W. A.—Reeves Newsom of New York City—who attended all technical and business sessions, and contributed much to the discussions. At the annual dinner he presented an interesting and enlightening address on "Some Obstacles Confronting the Water Works Man and the Part Played by A. W. W. A. in Surmounting Them."

President Newsom described three main obstacles that confront the water works men the country over, namely: (1) interference with his work by politicians looking for favors in the form of jobs for friends, also special favors in connection with delinquent water bills, and requests for small special jobs to be done without charge; (2) Fears of being turned out by a change of administration and being supplanted by someone with no qualifications other than political pull; (3) Inadequate compensation of the water works man, in proportion to the very important work he is doing. Two things were shown to lead to a solution of these problems. First, the doing of a very fine job of furnishing water, being courteous to all customers, and in general making everyone pleased with the work being done by the water works man. Second, making the public conscious of the importance of the work being done by showing them the character of work that is necessary in order to deliver pure and otherwise satisfactory water to them in the quantity desired whenever desired, even through drouth, fire, flood and all other calamities. It is only through proper public understanding of the importance of his work that the water works operators will be allowed to do it unhampered.

Mr. Newsom pointed out the important tools which the water works man has at his disposal. Through the American Water Works Association specifications have been set up so that he may now buy pipe, valves and other equipment with assurance that they will do the job; manuals and standards of procedure, representing years of work by many men, are available for almost every part of his work; new tools are being devised, such as the recent specifications for laying cast iron pipe and the new accounting manual that had recently been made available; fire hydrant, valve, meter and other specifications are being revised, and committees are busy on many other necessary studies in the water works field. The American Water Works Association Journal, which provides a reference work of papers by the foremost men in the industry, constitutes an irreplaceable source of information for our problems and of all that is new and being developed over the country at large.

The publicity program of the A. W.W.A. which is designed to make the public more conscious of the problems of water works men and more familiar with the type of work necessary to safeguard the health and property of the community served was called to the attention of the meeting. Mr. Newsom pointed out that time, brains and money are required to carry on this program,

C. W. Mengel Director Public Works and Service Greensboro

D. S. Abel Asst. Engr. N. C. Dept. of Health (Elected Vice-Pres.)

and that it is important for the various sections to interest water works men, especially those in the smaller communities, in assisting with it. Attention was called to the new grades of affiliate and junior mem-

*This report consists of excerpts from a more complete report prepared for us by Professor H. B. Gotaas, Dept. of Sanitary Engineering, University of N. C. Originally planned for our December issue, it was found necessary to carry it over to this issue.—Ed.

bership which enables water works men who have found it difficult to pay the full membership dues to secure the advantages of non-voting membership at a new reduced annual cost for a period of years.

Mr. Newsom registered a bullseye with his sincere and inspiring talk, and no doubt many who heard him are taking steps to join A.W.W.A. in its ardent efforts to better the social and economic as well as the technical status of the personnel of publicly owned water supply systems.

Maffitt Cup Again Won by Moore

The silver cup donated to the section by McKean Maffitt, superintendent of water at Wilmington, N. C., was won again by George S. Moore, superintendent of water and light, Albemarle, N. C. This award, made each year to the member responsible for securing the greatest number of members during the year, has for the third consecutive year been won

Maffit Cup Winner
Geo. S. Moore, Supt.
Albermarle, N. C.

Director A.W.W.A.
P. W. Frisk
Enka, N. C.

by Mr. Moore, who stands as indisputably N. C.'s No. 1 membership salesman.

Entertainment

The opening evening of the convention found members and guests enjoying a complimentary barbecue at the Police Club, the hosts being the Pomona Terra-Cotta Company and the City of Greensboro. Then the scene shifted to a complimentary dance at the King Cotton Hotel, given by the city. And at the banquet the following night, Toastmaster Andrew Joyner, general manager of the Greensboro News and former city manager of Greensboro, produced many laughs with his clever stories. The Recreation and Education Department of Greensboro provided an excellent home talent floor show.

Dr. I. V. Shunk, North Carolina State College, displayed "Luminous Bacteria" which he has isolated from sea water. One of his displays attracting much interest was a large A.W.W.A. sign in which the tubes of luminous bacteria formed the letters. Other ingenious displays showing the effect of oxygen on their luminous activity were shown.

Old Timer's Night

Members who have been connected with water and sewage works in North Carolina cities since 1909

Honored
For Long Service to Their Communities These "Old Timers" Were Among Seven Superintendents Cited

"Cap'n John" Michie (Durham)
John D. Cochran (Statesville)
William E. Vest (Charlotte)
John H. Bridgers (Henderson)

were honored at the banquet. Those cited were E. B. Bain, Raleigh; J. H. Bridges, Henderson; J. D. Cochrane, Statesville; L. A. Fisher, Concord; Capt. J. C. Mickey, Durham; J. C. Rickards, Canton; W. E. Vest, Charlotte, and L. A. Wyrick, Greensboro. Wishes for many more successful years of service and hearty applause was accorded this group of faithfuls.

Inspection Trips

Inspection tours arranged by C. W. Mengel, director of public works, featured Greensboro's new North Buffalo Sewage Treatment Plant. Everyone was convinced that, having been designed for maximum flexibility of operation, it would be possible to properly treat almost any kind of sewage or combination of sewage and industrial wastes in Greensboro's interesting plant, especially arranged to accommodate local industry.

The inspection of the plant of the Pomona Terra-Cotta Company at Pomona, N. C., was also of considerable interest to all.

At the Greensboro Filter Plant, R. W. Haywood, Jr., of the Industrial Chemical Sales Company demonstrated the cleaning of a filter bed with sulphur dioxide. Much interest was evidenced by the lively discussion and many questions asked.

Business Sessions

The following officers were declared elected for 1938-1939: President, W. M. Piatt, consulting engineer, Durham, N. C.; vice-president, D. S. Abell, assistant engineer, State Dept. of Health, Raleigh, N. C.; secretary-treasurer, A. R. Hollett, city engineer, Chapel Hill, N. C.; member of Board of Control, Sewage Works Federation, Dr. H. G. Baity, professor of sanitary engineering, Chapel Hill.

Secretary-Treasurer Hollett's reports revealed a worth-while membership growth during the year, and collections and cash on hand had both increased.

Newsom on Income Tax Question

President Newsom discussed the federal tax threat to state and municipal employees and state and municipal agencies that results from the Gerhardt case, decided May 23, 1938, which seems to reverse the earlier tax exemption opinions and ruling in the Brush case, handed down on March 15, 1937.

One preamble of the resolution passed reads:

> "Whereas, As a result, water works employees paid by states, counties and municipalities are confronted with a probable retroactive liability for Federal income tax on their salaries earned for every year back to 1926."

The resolutions in full:

> "First: That this Section requests the American Water Works Association through its Executive Committee and Board of Directors to take such action on this subject of Federal taxation of states as seems advisable.
>
> "Second: That this Section place itself on record as in favor of all members of both Houses of Congress supporting a bill in Congress at the 1939 session to prevent the retroactive application of any Federal tax upon the employees of the states and their instrumentalities.
>
> "Third, That the Section is in favor of opposition to any attempt to add to the cost of State and Municipal Government by Federal taxation without first securing the consent of the states through a constitutional amendment guaranteeing the reciprocal right to tax future issues of Federal securities in the state, and prohibiting any Federal taxation of the revenues and already issued securities of the states, their sub-divisions and agencies."

Operator Licensing Progress

W. M. Piatt, chairman of the Committee on Operator Licensing

reported on the North Carolina Operator Licensing Bill which had successfully passed the Senate, but in the rush of last-minute legislation had failed to pass the House.

In discussing the bill there was some concern over the possibility of older men who have learned the business in a practical way at their plants being forced out by the bill. Professor H. G. Baity, in his able manner, explained to the section the objectives of licensing and reasons for licensing, and without objection the Section voted to have the legislative committee steer the bill through the coming session of the legislature.

D. S. Abell of the State Dept. of Health brought up the matter of the bill, designed to overcome the difficulties in bringing technical evidence regarding sewage treatment and stream pollution before juries, and having the evidence receive its proper consideration, since there are no courts of equity in North Carolina. The bill provides that any municipality or sanitary district having a sewage treatment plant which discharges into a stream shall make such detailed records of the plant operation and the flow and quality of the stream as may be required by the State Board of Health. Further, a sworn copy of these records may be introduced as prima facie evidence at the instance of either party to any action. The bill also makes use of the competent referee method, and provides in the instance of an action concerning damages from nuisance or water pollution by a sewage treatment plant, that at the request of either party the action may be referred to an appointed referee, who shall have special technical knowledge and proven familiarity with sewage systems and treatment works.

The bill will put those cities making an earnest effort to properly treat their sewage in an excellent position to secure fair hearings based on technical evidence, rather than on opinions of lay jurors. The bill was referred to the executive committee for review and study before going to the legislative committee for steering through the legislature.

It was voted that a committee be appointed on "Hazards to Distribution Systems." In addition to studying the hazards on distribution systems it will emulate the practice of A. W. W. A. in looking into the possibility of cross-connections in convention hotels selected for future meetings of the Section.

Technical Sessions

(PRES. J. W. KELLOGG Presiding)

"Administration of the Water and Sewer Department of the City of Greensboro," by W. M. LYBROOK, superintendent of the Water and Sewer Department, Greensboro, N. C.

Prof. H. B. Gotaas, University of N. C. (Responsible for This Report)

W. J. Parks, Supt., Asheville, N. C. (Held a Water Clinic)

Roy Mills, Supt., Southern Pines, N. C.

Mr. Lybrook clearly described the seven divisions of the Greensboro Water Department. In their proper sequence from the point of supply through production, distribution, billing and collection, such divisions are: Supply Works, Purification Works, Pressure Pumping, Distribution, Meters, Administration and Fixed Charges.

The Supply Works includes the lake water-shed and reservoir, the Reedy Fork Pumping Station, the sanitary control of the water-shed force main from the pumping station to reservoir and the gravity main from this reservoir to the filtration plant in the city. The Supply Division is responsible for the sanitary control of the water-shed together with the soil erosion and reforestation program started on the water-shed some years ago, which decreased the silt deposit in the reservoir and the turbidity of the water.

The Purification Works includes the 6 million gallon filtration plant and two storage reservoirs having a capacity of 21 million gallons. The Pressure Pumping Works consists of a steam plant with turbine driven pumps having a capacity of 28 million gallons against a head of 260 feet. The superintendent of pumping stations is directly responsible for all pumping works.

The Distribution Division is charged with operation, maintenance and repair of mains, valves, hydrants, services and two equalizing tanks, the installation of new services and mains. This Division is headed by a Superintendent of Maintenance, who also heads the Collection Division of the Sewer Department. The function of the Meter Division is the repairing, testing, removal and replacement of meters. Meters smaller than 2 in. are tested on an average every three weeks. Those above 2 in. are tested in place every six months with a portable testing outfit.

Under the Administrative Division comes general supervision, meter reading, billing, collection and the investigation of complaints. The Division of Fixed Charges is set up for accounting purposes, the fixed charges being prorated to the different operating division on the basis of the ratio of the investment in the particular division to the total investment of the complete system.

Concerning the administration of the Sewer Department, Mr. Lybrook described the six divisions: Collection, Pumping, North Buffalo Purification, South Buffalo Purification, Administration and Fixed Charges. The Collection Division is charged with maintenance and repair of all sewers and services. Two full time crews and a crew working part time

Charlie and Jo Barbecue and Stew

with the water distribution division make up the personnel. The Administrative Division handles general supervision, costs and overhead, and the Fixed Charges Division prorates fixed charges against the four operating divisions.

Since the City of Greensboro lies in two main drainage basins, two treatment plants are required. The recently completed North Buffalo Activated Sludge Plant treats about two-thirds of the total sewage, including the dye wastes from the textile mills. The South Buffalo Trickling Filter Separate Sludge Digestion Plant treats one-third of the total sewage.

"Greensboro's New North Buffalo Plant," by E. H. MOSS, Superintendent of Sewage Plants, Greensboro, N. C.

Mr. Moss ably described the recently completed $700,000 North Buffalo Plant which has a design capacity of 7 m.g.d. and provides

primary sedimentation, aeration, secondary sedimentation and separate digestion of the activated and primary sludges. Perhaps the most novel design feature is the provision for application of chemicals at various points in the plant when and if needed. The entire plant is controlled from one central operating building, which houses the gas engines, sludge filtering equipment, pumps, laboratory and chemical treatment facilities. The plant has a capacity of 7 million gallons per day and will treat the dye wastes from the Cone Mills and the domestic sewage from a present population of 40,000. Mr. Moss explained that at present only domestic sewage is being treated during the tuning up stage, the dye wastes to be introduced very soon. Extensive studies by the City of Greensboro and the Cone Mills provided information indicating the advisability of providing ample design flexibility for most efficient operation of the plant.

Sewage is brought to the plant through 48-inch and 21-inch outfall sewers, metered and passed through either one or both comminutors, thence through either or both detritors, which have a combined capacity of 13 m.g.d. From the detritors the flow may be directed in any one of several different ways. First, directly to the four primary sedimentation tanks, operating in parallel or series. Second, to the chemical flash-mixer and flocculators, and then to the primaries operating either in parallel or series. Third, the flow may be routed to one set of two primaries and returned to the flash mixer and flocculators and thence to the second set of primaries, which become chemical precipitation units. Fourth, the sewage may be taken directly to the aerators from the detritors. The flash mixer and flocculators have a capacity of 13 m.g.d. and the four primaries have a combined retention time of 3 hours at 7 m.g.d. From the primary tanks the flow may be routed either to the four aeration units having a combined retention of 7 hours at 7 m.g.d. (spiral flow type designed for "tapered aeration" and for operation of the two banks in parallel or series); or directly to the secondary sedimentation units. The latter are two circular center feed sedimentation units having a combined retention time of 1.8 hours at 7 m.g.d. and as with the other units of the plant these may be operated in either parallel or series.

All sludge from the several processes is digested in two heated tanks with floating covers. The tanks have a combined capacity of 150,000 cu. ft., and are designed to operate as single or two stage digesters. The digester temperature is controlled by heat recovered from two gas fired boilers, and the two gas engines. Digested sludge is passed through a two-stage counterflow set of elutriation tanks in which plant effluent is used as wash water. After elutriation the sludge is handled by a variable speed elevator to the conditioning tank, where chemicals are added prior to dewatering on two continuous vacuum filters. The dewatered sludge cake is discharged onto a belt conveyor, thence to a bucket elevator depositing it in an elevated tank, from which it is hauled by truck to stock pile.

Gas is used for power in two 160 horsepower 3 cylinder gas engines, directly connected to 100 k.w. alternators and exciters. The switchboard is arranged so that any part or all the load may be carried by the engines, or by an outside source of power.

Mr. Moss presented the following average operating results on 3.5 m.g.d. of domestic sewage, obtained without chemical precipitation, but with the aid of mechanical flocculation. The crude sewage had averaged 265 p.p.m. suspended solids and B.O.D. (5 day) of 372 p.p.m., dissolved, oxygen being absent. Performance was as follows:

Primary Tanks (Avg. Retention time, 5 hrs.) % Reduction Susp. Solids, 65.0. % Reduction 5 day 20° C. BOD 51.0. Cu. Ft. sludge per 24 hrs., 15,000. Solids, 1.4%; Volatil., 68%.

Aeration Tanks (Avg. Retention time, 5 hrs.) Air per gal. of sewage, 0.8 cu. ft. Susp. solids in mixed liquor, 600 ppm. Activated sludge returned, 27.5%. Wasted sludge (to primaries), 20.0%.

Plant—% Reduction Susp. Solids, 95.0. % Reduction 5 day BOD, 96.0. D. O. (ppm) in final effluent, 1.6.

Concerning the digesters (not seeded when the plant was placed in operation), 37,000 lbs. of lime was added to the tanks for 58 days. At present the tanks are operating at a maintained pH of 6.8 without liming.

Digestion—

Solids pumped to digesters/24 hrs., 15,000 c.f. (1.4% solids, 68% organic).

Digested sludge from digesters/24 hrs., 2,000 c.f. (3% solids, 53% organic).

Gas production/24 hrs., 66,500 c.f. (50% methane, 540 B.t.u./c.f.).

pH of tanks, 6.9; Temp. of tanks, 90 deg. F.

Dewatering of Digested Sludge—

Filter hrs./day = 4.7; yield sq. f./hr. = 2.3 lbs. dry solids.

Filter cake 25% moisture, % Conditioner (dry basis) = 6.48.

Power Production—

Power generated = 95% of requirements.

Distribution of power = Air comp., 65%; Accessories, 33%; Lights, 2%.

Avg. B.t.u./K.w.h. = 17,000.

Total operating cost/mg. = $13.55.

Determining Residual Ammonia in the Presence of Chloramine, by P. W. FRISK, Mgr. Chemical Laboratory, Enka Corporation, Enka, N. C.

Mr. Frisk discussed laboratory experiments carried on to determine whether or not residual ammonia, above that available for chloramination, can be estimated by nesslerization. Ammonia determinations were made on samples in which 0.5 ppm of chlorine was added to each sample and the chlorine to ammonia ratios were varied between 2 to 1 and 1 to 8. A third series contained one solution with a definite excess of ammonia, one with a definite excess of chlorine, a third with chlorine and no ammonia, and a fourth with ammonia and no chlorine was run. The pH of the solutions was controlled. The re-

At Greensboro's New Sewage Treatment Plant Designed to Treat Industrial Wastes with Sewage

sults showed that ammonia recovery decreased as the chlorine was increased.

Mr. Frisk interpreted the results as follows:

1. The ammonia and chlorine will give residual ammonia when combined at a ratio below 1 to 7.
2. The pH of the combined solution from 2.0 to 8.5 appears to have no effect on the decomposition products giving ammonia.
3. When the ratio of ammonia to chlorine is greater than 1 to 2.5, the ammonia recoverable decreased very rapidly.
4. It is not reliable to attempt to determine the amount of uncombined ammonia present in a solution of ammonia and chlorine when the ratio is below 1 ammonia to 7 chlorine.

A. E. Griffin, Wallace and Tiernan Company, in commenting on ammonia recovery, raised the question as to whether the ammonia was destroyed by the reaction with the chlorine in the water or in distillation. He said that he had found that when the residual chlorine was high, the recovery of ammonia was low; however, when the sample was dechlorinated first the ammonia recovery was high.

24 Hour vs. 43 Hour Plate Counts, by LYNN MADDRY, Bacteriologist, N. C. State Board of Health.

Mr. Maddry pointed out recent epidemics of stomach and intestinal disorders whose origin was traced to water supplies that common tests showed to be safe. In the laboratory analysis of various water samples it was observed that some samples having a very low 24 hour plate count produced an abundant growth in selective broth media, indicating that there were many more bacteria present than were shown by ordinary plate counts.

In investigating this matter, Mr. Maddry made 24 hour and 48 hour counts on 164 water samples examined over a period that included all seasons of the year. Open wells showed a high count at the end of 24 hours and an average increase in count of 32 percent at the end of 48 hours. The samples from protected wells had a small 24 hours' count but at the end of 48 hours the count had increased on an average of 2,500 per cent. The treated and filtered supplies showed an average increase of 90 percent in comparing the 48 hour with the 24 hour count. Graphs and tables of the results were presented to reveal the importance of the problem which deserved further studies.

J. W. KELLOGG, State Dept. of Health Laboratories, felt that the 24 hour count does not show the whole picture; that symbiosis and "acclimatization" to the media were no doubt responsible for part of the increase.

J. C. LITTLE, Chapel Hill, stated that he had observed large increases in the 48 hour count over the 24 hour count for swimming pool samples.

H. B. GOTAAS, Univ. of N. C., stated that he had observed large increases of the 48 hour count over the 24 hour in chloramine treated swimming pool samples and raised the question whether the disinfecting agents on certain organisms might be inhibitory rather than completely destructive.

Sulphur-Dye Waste Sludge Digestion

The Textile Research Foundation, through the University of North Carolina, has been carrying on a program of research looking toward the effective treatment of wastes from textile mills. Experimental work on the effect of the dye wastes on different phases of treatment (directed by Dr. H. G. Baity) has been done at the experimental station at Greensboro.

A paper, **Studies on the Effect of Sulphur Dye Waste Upon Sludge Digestion,** by RALPH PORGES and H. F. MILES, special investigators, and DR. H. G. BAITY of the University of North Carolina, was presented by Mr. Porges.

The objects of the sludge digestion studies were to find (1) the effect of sulphur black dye waste on sludge digestion and if possible to determine the tolerating limit of this dye waste, (2) the effect on the digesting of activated sludge that has been used in treating an influent consisting of sewage and dye, (3) the effect of various amounts of seed material upon sludge-dye mixtures, (4) the effect of "acclimatization," and (5) the effect of dye wastes upon the dewatering of digested sludge.

The sludges were digested at 82 deg. F. in one gallon bottles. The quantity of gas produced was measured and analyzed and the total and volatile solids were measured before and after digestion. Sewage sludge without dye wastes was used as a control. Bottles were filled with varying ratios of ripe sludge to activated sludge, to which were added varying amounts of sulphur dye waste.

Activated sludge which had been used to treat sewage containing varying amounts of dye waste was incubated under the same conditions. In determining the effect of "acclimatization," ripe sludge from the digested dye waste samples was used to seed other bottles. To determine the effect of the dye waste on the dewatering of sludge, portions of the various samples were filtered in Buechner funnels through a previously moistened filter paper.

Mr. Porges presented curves and tables showing the results of the experiments. In discussing the results he drew the following conclusions:

1. Sulphur black dye, as received, is detrimental to sludge digestion in concentrations as low as 0.5% by volume. Concentrations above 6% virtually stop gas production. The methane content of the gas is also decreased by the addition of dye.
2. Sulphur black dye wastes removed from sewage by activated sludge is tolerated in higher percentages than dye added directly to digesting mixes. However, gas production is reduced in any event.
3. When very large quantities of seeding sludge are used the initial lag

(1) John Woodson, Sales Mgr., Lynchburg Foundry

(2) Charlie Becker and Guy Northrup are not in the grasp of "the law"—it's just Chief Shaw of Greensboro's Fire Dept. they're with

(3) T. E. Witty, Supt., Water and Sewage at Thomasville, examines some of the Greensboro sludge

(4) State Dept. of Health Engrs. E. W. Kearny and R. F. Hill, Jr.

(5) Chas. F. Thomas, Sales Mgr., Roberts Filter Co.

(6) Chicago Pump's Sam Kappe and Link-Belt's Smiling Joe Gilbert

in gas production is reduced to a minimum and larger quantities of dye wastes may be tolerated.

4. There is a tendency toward increasing tolerance of the sludge to sulphur black dye wastes.
5. As the dye waste increases with a corresponding decrease in digestion, as measured by gas production, the rate of dewatering only slightly decreases, but more chemicals are required in sludge conditioning.

Recent Developments in Water and Sewage Treatment in North Carolina by W. H. BOOKER, Director, Division of Sanitary Engineering, N. C. State Department of Health.

Mr. Booker reviewed the progress made in water and sewage treatment in North Carolina. At the present time the 86 incorporated cities of the state having a population of over 2,000 all have public water and sewer systems. Of the 75 incorporated cities having a population between 1,000 and 2,000, 73 have water and sewerage systems and one of the two delinquents has voted a bond issue and will soon start construction. Twenty-four of 32 towns having a population between 800 and 1,000 have water and sewerage systems and 4 of the remaining 8 have voted favorably on bonds and will have proper facilities shortly. Forty-five of the cities having a population under 800 have water and sewerage works and 17 have voted favorably on bonds and have received federal aid allocations with which to install new systems. This will bring the number of public water supplies and sewer systems in North Carolina to approximately 250.

In discussing the number of recent water and sewage works projects and their cost, Mr. Booker stated that during 1932-33 five water and sewer projects were built using R. F. C. and private financing. Under the first P. W. A. there was $4,125,000 invested in new water and sewage works construction, while during the second P. W. A. the new improvements amounted to about half that of the first. In the present P. W. A. program 48 water and sewer projects costing approximately $6,643,000 have been approved.

In addition to P. W. A. construction much has been done through W. P. A. toward making water and sewage facilities available to all. As shown by the following table of W. P. A. projects.

	No. of Projects	Total Cost
Water Purification Plants	6	$66,882
Water Distribution of Systems	64	532,243
Water Storage	24	204,545
Sewer Systems	134	1,899,975
Sewage Treatment Works	21	228,428
Water and Sewer Combined	67	614,528
	316	$3,546,601

The Use of Property Records in Water and Sewage Works by PROF. H. B. GOTAAS, Dept. of Sanitary Engineering, University of North Carolina.

In discussing property records, which are concerned with costs and conditions that have presented themselves in the plant but are not yet reflected in the cash transactions of a water or sewage works, Mr. Gotaas described the following functions and uses of property records:

1. To provide an accurate inventory, always up to date, of all property owned by the plant. Included in the record are a description of the property, the cost, age, and probable life. (The difficulties met with in developing a property record system for existing property as compared with future property were shown.)
2. To furnish detailed cost data for rate making purposes.
3. To keep a relatively accurate record of the depreciation of units or of classes of property, as contrasted with the method of applying some arbitrary composite percentage to the value of the entire plant regardless of the diversity in the service life of the equipment.
4. To furnish much needed information concerning the service life of water and sewage works property, which is valuable not only in the operation of plants but also to the engineers expected to make economic selections of water and sewage works equipment.
5. To provide information concerning the cost of repairs, maintenance, and output of specific equipment. (These data when used with depreciation will allow a comparison of operation costs of similar equipment by different cities as well as showing at what time it is cheaper to install a new unit than to pay large maintenance and repair costs on the old unit.)

Mr. Gotaas favored the loose leaf type of property record form, since only those pages which are necessary for current work need to be carried in the book and additions can be made whenever they are required. The records should be designed to provide for entries on the following information:

1. The description of the unit and general information incidental thereto.
2. Dates of various entries.
3. Original cost new of unit and cost of additions and replacements.
4. Service age and probable life.
5. Condition percent and present value.
6. Annual depreciation and the depreciation reserve.
7. Repairs and maintenance.
8. Other information such as fuel cost, output, and time used pertinent to specific equipment.

Examples of property records and their application to various types of property were illustrated. Combining like units of property such as meters, hydrants, water mains, etc., and accounting for them as one unit, Mr. Gotaas recommended as a means of reducing the amount of detailed work. It was pointed out that to adequately maintain a property record system, the information must be kept by people familiar with the characteristics of the property, that is, someone concerned with the operation of the works.

REEVES NEWSOM, President of A. W. W. A., added that there had been a lot of guessing going on where records are not used and that property records are a necessary and coming tool in water and sewage works management. He pointed out several of the difficulties in combining units into a group and accounting for the group as a whole.

D. S. WILLIAMS, Durham, N. C., stated that amortization of bonds over a given period served to offset the depreciation item in the plant costs.

Ten Years of Office Management by HUGO WALKER, Water Dept., Durham, N. C.

Mr. Walker, in discussing the problems of office management, emphasized the courteous and tactful manner in which complaints should be handled and suggested other methods for developing the good will for the water utility. It was pointed out that where unavoidable wastes are responsible for an unreasonably large water bill, adjustments are made in the bill, and this usually produces good will which far outweighs the discount on the bill. In regard to the collecting of bills, a penalty charge not used as a revenue measure was found to be very satisfactory. In Durham the allowances on bills and uncollectible bills have amounted to 0.003% of the total col-

lections. In closing, Mr. Walker identified the office management personnel as the "shock absorbers" who must maintain pleasant relations with the public.

Water and Fire Fighting, by SHERWOOD BROCKWELL, State Fire Marshal, Raleigh, N. C.

Mr. Brockwell called attention to the fact that too much time elapses between the turning in of a fire alarm and the actual application of water to the fire by the fire department. By illustrating the difficulty in fighting a fire in a long basement having only one entrance, he pointed out the need for sprinkler systems in buildings and other water facilities superior to those now in general use so water can be applied immediately after the outbreak of a fire.

Mr. Brockwell remarked that after a fire brigade reaches the scene of the fire, strangely enough, it takes approximately as many motions to get water on the fire as it did fifty years ago.

The Clinics

The final morning of the meeting was devoted to the "Clinic," to which problems were brought for diagnosis and discussion.

The "Sewage Clinic" was ably conducted by E. H. MOSS, Supt. of Sewage Plants at Greensboro, and the "Water Clinic" was under the excellent charge of W. J. PARKS, Supt. of Water at Asheville.

Sewage Clinic

"In opening the Sewage Clinic," Mr. Moss discussed some of the operating problems at an activated sludge plant, pointing out the effect on the process of sudden shock caused by high concentrations of industrial wastes. In reply to a question by Mr. Abell concerning the **operation of flocculators without the addition of chemicals at the North Buffalo plant,** Mr. Moss said that when using the flocculators a reduction of suspended solids of about 80% had been obtained; that the flocculators build up a floc but the sludge is very thin, does not settle readily, and is difficult to remove from the primaries; that the sedimentation efficiency of the primary is reduced somewhat due to a large portion of the basin being filled with sludge, and that at least 50 per cent greater sludge digestion capacity is required.

D. S. Abell opened the discussion of **High rate filtration** of sewage by describing the recirculation features and the distributing equipment of the Orthopedic Hospital plant at Gastonia, N. C. Mr. Porges, Textile Research Foundation, described research studies they are carrying on to determine the optimum number of circulations, the effect of detention time, and the rate of circulation. He stated their results indicated that the detention time is more important than the number of circulations. In their experiments when employing two circulations through the filter, and two hours' detention in the tank, just as good purification was obtained as when the sewage was recirculated ten times. He pointed out that they had operated experimental filters at rates as high as 150 m.g.a.d. and found that the slower the sewage passes through the filter the higher is the B.O.D. removal on a percentage basis. However, the higher the B.O.D. of the sewage the greater is the total B.O.D. removal in pounds.

E. N. Shelton, Atlanta (The Tennessee Corp.)

Bob Haywood, New York (Boy from "Down Home" Makes Good with Important Carbon Firm)

A. A. Kramer, New York (L. A. Salomon & Bros.)

B. W. GRAHAM, Activated Alum Corporation, discussed the difficulties experienced by a plant in Maryland treating wastes from a corn canning plant. He stated that coagulants would not touch the wastes and that the two circulations on the trickling filters caused the growths to slough off too much. Through experimentation it was found that heating the material would form an excellent floc that would readily settle out. Heating to the boiling point was not required and waste steam at the plant could be used to warm the waste before it reached the sewage plant. MR. TRUE, Proximity Mills, stated that he had been able to effect coagulation of a certain troublesome tannery waste by heating.

Grit removal, effect of CO_2 on chemical precipitation of sewage and sludge dewatering, were other problems receiving clinical attention at the hands of Mr. Moss and the group.

Water Clinic

Mr. Parks presented the problem of **Manganese Removal** to the group for discussion. Mr. Frisk in discussing the problem stated that manganese may remain in water tied up with organic matter or as a salt. It might be 85% removed by oxidation and sedimentation and the balance removed by the filter sand. He pointed out the necessity of having a manganese coating on the sand and explained that the coating could be regenerated with permanganate, which in his plant is applied with the alum-solution feed. It was also stated that manganese could be effectively removed through oxidation by chlorine added to the water.

A. O. TRUE added that when cleaning their elevated water tank at Proximity Mills they had found heavy layers of manganic material which had deposited out in the tank and that he had considerable trouble with manganese. N. D. DOANE, Permutit Co., Charlotte, N. C., described the Permutit iron and manganese removal process, pointing out that the green sand zeolite has been treated with manganese and will satisfactorily remove iron and manganese by catalytic action, permanganate being used to regenerate the sand. He said that in treating the green sand for manganese removal the base exchange softening powers were largely destroyed.

The problem of cross-connections and inter-connections was then presented by the chairman.

DR. H. G. BAITY stressed the need for attention to the cross-connection problem, adding that it is the greatest hazard now confronting water works men. He pointed out that the major cause of water borne outbreaks had been traced to pollution getting into the water after it has been purified at the plant.

Anthrafilt as a filtering material was presented as Topic No. 3. The shape, effective size, uniformity coefficient, specific gravity and filtration efficiency of anthrafilt were discussed. Lower wash water requirements due to the low specific gravity of the material and longer filter runs were mentioned. It was also pointed out that there is greater penetration of the floc than in sand filters, and that it is easier to remove mud balls from anthrafilt.

Problems including the effect of the wage hour law on water plant operation, engine operation, and other water works troubles occupied the attention of the group.

HAZARDS AT SEWAGE TREATMENT PLANTS

Some Safety Measures at the Freeport Plant

By LAWRENCE LUTHER
Manager, Department of Sanitation
Freeport, Long Island

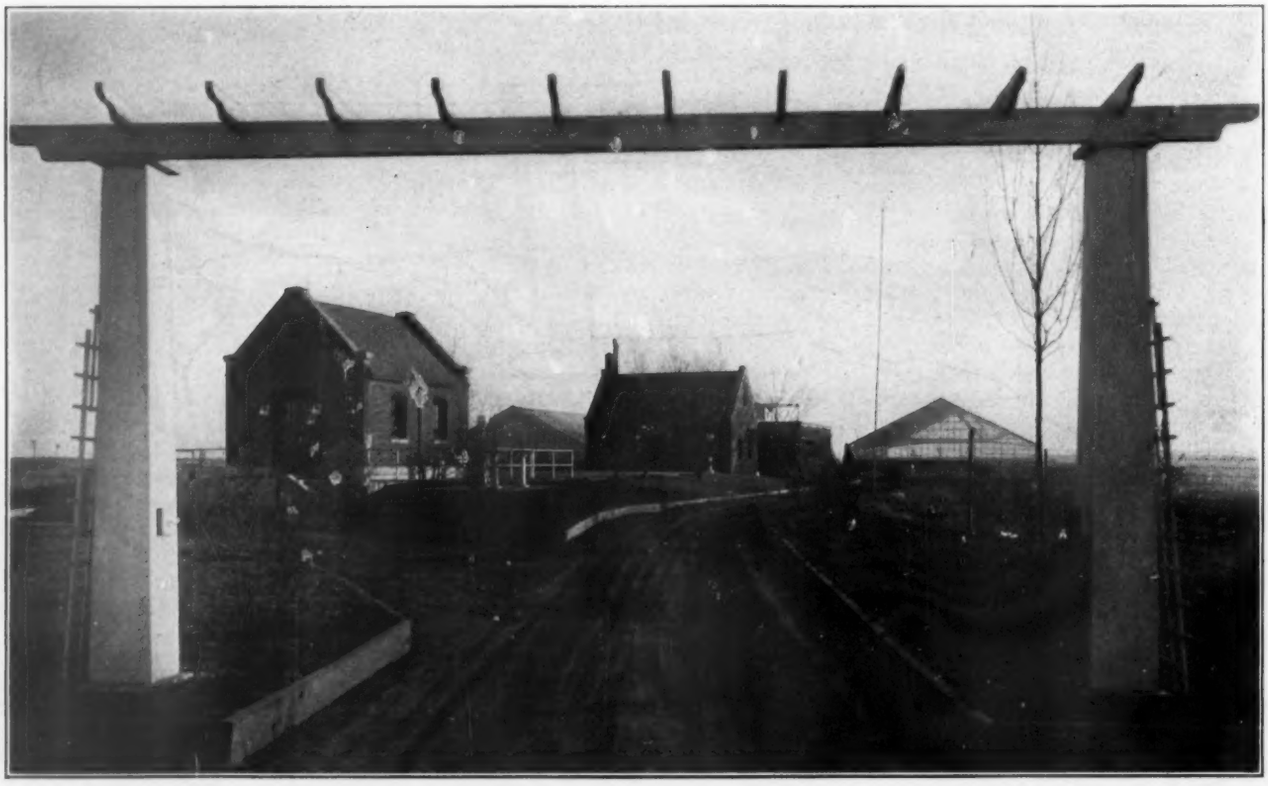
IN CONSIDERING "Safety at Sewage Treatment Plants," let us at the start study our a, b, c's—*A*lways *B*e *C*areful! This applies not only to the operators but to superintendents, commissioners, and to the host of visitors to sewage plants throughout the year.

With such a subject it is most difficult to know just where to begin. To definitely state what the operator should "always be careful of" is impossible, because after all he is such a diversified person—a person of dual personality that it is almost impossible to catalogue him. If I were asked for a definition of the title "sewage plant operator," I am afraid that my answer would be something like this: He must be an ingenious individual, capable of doing plumbing, carpentering, steamfitting, pipefitting, masonry, electrical and laboratory control work. This definition, I believe, embodies a few of the attributes an operator must have. These diversities, of course, place the operator in probably the most hazardous position of any person associated with a sewage plant.

The slogan *"Always Be Careful"* cannot be preached too much or thought of too often. A slip of a wrench, a spark, a carelessly lit match, the flicking of a cigarette ash, the turning of the wrong valve may cause a serious or fatal accident. Most accidents, however, are caused by carelessness or thoughtlessness; a failure to realize or continue to realize the continuous existence of hazards.

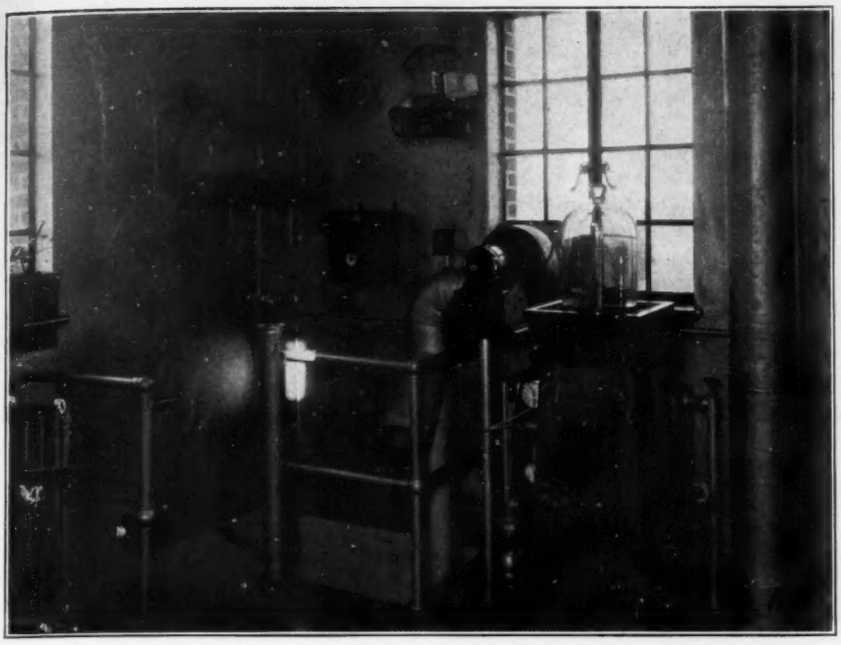
The Author

There are many types of hazards to be guarded against. Physical injuries, for instance, those caused by falls, which may in turn be caused by the dropping of oil or grease on stairways or floors, accidents caused by unguarded wheels, pulleys and gears; slipping into an open sedimentation tank may cause drowning. One must be continuously on his guard against infections. No cut is too small to gloss over. A first aid kit should always be available; an application of iodine may stave off the



Freeport's Treatment Plant

Provides chemical precipitation, pre-and post-chlorination, separate sludge digestion—in the summer, roses for visitors.



Three Warning and Safety Devices at the Freeport Plant

The little black box on the wall is the M. S. A. gas-indicator and danger alarm. Above is the "secondary defence" spotted around the plant—one of the canaries. Beyond the chlorinator is the furnace pit-ventilating blower in continuous operation.

loss of a finger, hand or arm. Then there is the ever present danger of asphyxiation from either sewage gas, chlorine, or carbon monoxide to think about and, of course, to be guarded against.

Gas Warning Devices

There are many cheap and easy ways to install devices to help to guard against this ever present explosion or life snapping hazard. For instance, the Mine Safety Appliance Co. has a carbon monoxide alarm which is absolutely fool-proof. Canaries are cheap and are the best little gadgets for this type of hazard. The installation of a fresh air blower is easily made in the average plant and will continuously insure the bringing of fresh air into the cellar or closed off room where gas burners are in operation.

The canary idea is not new. Besides acting as an alarm they add something to a sewage plant. Their chirping is cheerful and adds interest to a plant. Their presence is novel and pleasing to visitors. At the same time they can boast a very utilitarian value of the highest sort —life saving.

Explosions invariably can be traced to faulty switches, motors that are not spark-proof, short circuits, carelessly tossed matches, and from mishandled tools. In this day and age of closed switches, spark-proof motors, and tools of the proper design there seems little or no reason for some of the disasters that occur from time to time.

It behooves each and every operator and superintendent to take preventative measures to overcome the many causes of accidents in and around his plant. Safeguards are cheap and invariably easy to install. "Cleanliness is next to Godliness"—and it is just as easy to keep a plant clean as it is to allow it to become disorderly and dirty.

Gas Masks

Gas masks cost very little and should be available for immediate usage. However, make sure that they are not down in the cellar or hidden away in a closet. Have them, if possible, in a box outside the building where they can be used on a moment's notice.

A simple railing or chain will very often prevent slipping into an open tank. Gratings are easy to install. To sum it all up—if good plain, common horsesense is used and old man carelessness thrown aside, accidents can and will be prevented.

Prevention Study

Insurance companies, today, are most anxious to hold monthly or quarterly safety meetings of all employes. Why not call up your insurance agent and arrange for such a lecture. The American Red Cross will be found most co-operative in organizing first aid classes if a large enough group can be gotten together. Movies depicting accident prevention work are available from all the larger companies. The State Insurance Fund is doing a marvelous piece of work in this connection. It is the duty of plant superintendents and commissioners of public works, etc., to train their employes to be on their guard at all times against possible accidents, to provide the necessary first aid equipment and its proper usage.

The laboratory and office has its safety-indicating canary also.

Some Safeguards at Freeport

One picture which accompanies this short article shows three safety devices installed in a very small area at the Freeport Sewage Treatment Plant.

First, our tried and true friend, Mr. Canary. He, of course, will stop chirping and then fall over if carbon monoxide, methane or chlorine fumes are present. In addition to this, the Mine Safety Appliance gas alarm

(pictured) will start bellowing its cry when the atmosphere becomes dangerous from gas or oxygen deficiency. Thirdly, Mr. Ventilator is continuously bringing fresh air into a sub-basement wherein is installed all of our gas burning and furnace equipment.

Another picture shows our laboratory and office room. Here, too, another canary adds to the cheerfulness of the room, interest to visitors, and safety of the operators.

Another wrinkle which we have put into effect in Freeport and which has worked out quite well, is to have the night and Sunday operators call the Police Department on the hour every hour. These calls are noted on the "blotter" at the police desk. If the call does not come in before one minute past the hour, a motor police officer is immediately dispatched to the sewage plant. This system has worked out very well. It keeps the operator alert and helps make the night shifts just a little bit less dull. At least the operator has some one to talk to every hour and he also knows that in case he should fall and be unable to reach the telephone, aid will come to him at least within an hour.

When all is said and done, no matter how much your superintendent or commissioner may preach safety, no matter how many safety devices are installed, the human element is ever present and if one persists in being careless then all of these things will be of no avail. The slogan used in the beginning of this rambling discourse "Always Be Careful" should be the slogan of each and every man associated with the science of sewage treatment and disposal.

CHARLIE HOOVER HONORED BY ASSOCIATES AND HIS CITY

Thirty Years of Distinguished Service Recognized

A No. 1 Citizen—His Mayor and His Friends

Left to right: Prof. Chas. W. Foulk; Chas. P. Hoover; Mayor Myron B. Gessamon; M. R. Maddox, Pres., Chamber of Commerce.

Last month Charles P. Hoover, long Chemist in Charge of Columbus, Ohio, Water Softening Plant and recognized authority on water softening problems, was honored at a testimonial dinner given by 100 of his friends and associates in recognition of 30 years of distinguished service to the city of Columbus.

On hand was Mayor Myron B. Gessaman to praise the work of Mr. Hoover. Professor Charles W. Foulk of Ohio University served as toastmaster, and addresses were made by Dr. McPherson, the acting president; Professor J. R. Witherow and Dr. Wm. Lloyd Evans of Ohio State University, Clarence B. Hoover, Director of Utilities, and Lewis Llewellyn, Director of Public Service.

Dr. Evans, as head of the Department of Chemistry of the University and representing the local section of the American Chemical Society, highlighted the service of Mr. Hoover to the city and in the field of water treatment. From his address the following excerpts are taken:

> "Not only has the City of Columbus profited by the activities of Mr. Hoover, but the science of chemistry has also, because during this 30 years 57 technical and research papers and two books have come from his pen.
>
> "These papers show a constant effort to improve the methods employed for softening water, in order to make it more desirable for industrial and household purposes, and also in purifying it to make it safe for drinking—and, Mr. Hoover has constantly moved forward.
>
> "During these years recognitions of an academic character have come to Mr. Hoover. The Society of Sigma Xi of the Ohio State University, a national honorary scientific society, devoted to the advancement of research work, elected him to membership in 1920. Last year the Ohio State University Chapter of Phi Lambda Upsilon, a national honorary chemical society, made him one of its members. In 1935, he received the professional degree of Chemical Engineer from the Ohio State University.
>
> "Dared I digress, I should like to tell you many fine things concerning his most admirable qualities as a neighbor . . . His kindliness and friendliness to his fellow scientists is unsurpassed."

And, if we know the man—and we believe we do—for this last attribute Charlie Hoover stands out preeminently. His helpfulness and inspiration to young men, his interest and pride in seeing those who have profited by service under him attain sucess, plus that "kindliness and friendliness to his fellow scientists," have made for Charlie Hoover the host of friends and admirers that is his. May he long enjoy such enviable and deserved esteem!

A COUPLE OF IDEAS AND SOME GADGETS

Another Open Letter from One "Super" to Another

By "DOC" TAYLOR
Plant Superintendent, Roanoke Water Department

Roanoke, Va.,
Dec. 30, 1938.

DEAR BILL:

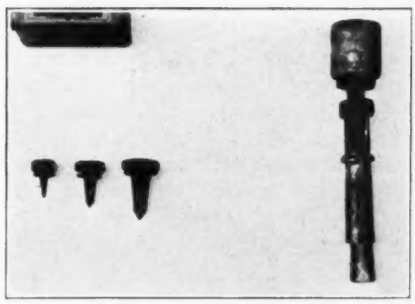
The office was closed last Monday for the Christmas Holiday, and we had a great time "calling around" on friends keeping "open house." It seemed to be a "big" Christmas, with the usual display of hospitality and plenty of good Virginia egg-nog for those inclined.

Bill, it was just about the first Christmas I can remember that we didn't receive a report of a fire hydrant knocked over by an "unknown" auto. In fact, we didn't even receive a call of any kind. So, we think, Santa Claus was good to us.

There is a slogan which reads, "Give Something Useful," so here is a New Year's "card" that I thought you might be interested in. On the left of the enclosed photograph you will see three unusual looking screws. These little gadgets are called Tap-Plugs. These plugs have a hex head, with a gasket just underneath the head, and tapered thread. They also have a longitudinal machined slot, which is the secret of their usefulness.

You perhaps have often seen your men accidentally punch or break a small hole in a main with a misdirected pick point. Well, Bill, in such instances it is the simplest thing in the world to screw one of these plugs into that hole, and "believe it or not," the plug cuts its own threads as it is being screwed in. They can be purchased in many sizes to fit most any size hole, and they work equally as well in cast-iron as in wrought-iron or steel pipe—also tank walls and hot-water boilers. These very useful little tap-plugs are manufactured by the Wolverine Brass Works at Grand Rapids, Michigan. And, Bill, I'm not getting a nickel for that last line—just for the good of the cause, my boy!

On the right, in the photograph, is a gadget made by one of the boys at another one of our plants. It is used for installing copper service pipe. The lower end of this gadget consists of a tapered shaft over which there



My New Year's Card to You, Bill

is a split sleeve. At the top of this sleeve you will note a square nut. When this sleeve is inserted in a piece of copper tubing and the square nut turned up with a wrench, the split sleeve expands in the inside of the copper tubing and grips it very firmly. On the other end of this gadget is a three-quarter inch coupling. This coupling is screwed on the end of the existing galvanized service pipe which is to be renewed with copper tubing. This connection may be made either on the end of the galvanized service pipe next to the main or on the end of the curb. Enough excavation is made at the opposite end of the pipe section to operate a pipe-pusher, only in this instance the pipe pusher is operated in reverse, as a pipe-puller. As the old worn-out galvanized service is pulled out with the pipe-pusher in reverse, the new copper tubing follows along through the same hole. And there you have renewed a service line without having to trench all the way across the street. The same scheme can be used to save ruining grass plots, in addition to the cost of trenching and filling.

Bill, while talking about services and copper tubing I had a laugh not long ago, while visiting one of our neighboring cities. The superintendent, a mutual friend of ours, had just recently started using copper tubing for service pipe. I asked him how he liked it, and you will be surprised at his answer. He said, "The only objection I have to it is that it is so dern difficult to pull it straight in the trench." Bill, I always thought that one of the attributes of copper tubing is the very thing that our friend considered a fault.

I had an idea that the slight kinks or curves, that should be purposely left in copper service pipe when you install it, afford just the proper safety factor against service line breaks that the "swing joint" and lead "goose-neck" did in the event the main settled, as some other strain was put on the service. In other words, the boy "had something" and didn't realize it.

Bill, it seems that I have sort of gotten started and can't quit, so here's a real "tip," I think. As Andy would say, "hit me in the head," and I will just tell you about it *now*. Scattered over our plant, and particularly in some underground booster stations that we have installed under sidewalks, we have a good bit of pipe and equipment that, due to condensation, never gets dry. And, if I am not mistaken, you are in the same boat. Well, like many others, we have tried all types and kinds of paint and so-called protective coatings. Now, at last, I have found one that certainly does the "trick." It can be obtained in all colors, but my experience has been confined to black and gray, and most of it to the black. It is known as Quigley Triple-"A" paint, and you should write the Quigley Company, at 56 W. 45th St., New York City, for a sample of this astonishing "sweat-proof" paint.

Honestly, Bill, we have painted underground piping with water dripping off it with this paint, and with surprising results. After two years the original coating presents the same coverage and glossy appearance that it did when it was applied.

Well, Bill, so much for tonight. I am installing a new boiler-feed pump at the steam plant tomorrow, and I guess I had better store up a little energy.

Yours, for the best of everything,

"Tom"

N. Y. SECTION HEARS

World's Fair Water Supply Described; Electric Grounding Discussed

Ernest L. Meyer, Chairman

AT THE winter half-day luncheon meeting of the N. Y. Section of A. W. W. A., held at Hotel Pennsylvania in New York City on December 29, a description of the N. Y. World's Fair Water Supply Facilities was featured. The meeting closed with the customary Round Table, the topic being "Electrical Grounding on Water Pipes."

The meeting opened with a brief talk by Reeves Newsom, president of A.W.W.A., who presented an interesting talk of conditions in the water works field, a spot review of progress and development in water supply during the year, and the major accomplishments of A.W.W.A. in a like period. (See Mr. Newsom's review, especially prepared for Water Works & Sewerage, which is the feature article of this issue. —Ed.)

In describing "The Water Supply System of the N. Y. World's Fair Grounds," and the many construction difficulties met with, Benjamin Eisner, chief sanitary engineer of the N. Y. World's Fair 1939, Inc., explained that in the 13 miles of distribution piping some of it was of permanent installation to be retained in the park and parkway development. The temporary mains called for construction of such nature and, therefore, an economic balance between construction and anticipated maintenance costs had been taken as the criterion in planning and design. Into the system had gone four types of pipes—13% being cast iron, 9% being coated and lined steel pipe, 78% being the asbestos-cement "Transité" pipe. Interesting were the many difficulties experienced in movement and breakage of pipes due to unstable ground conditions (fill) and heavy trucking over the area. In some instances resultant pipe movement had been, not a matter of inches, but one of feet. In making the 800 service connections, it had been necessary to put on full steam to keep ahead of the mushroom building construction rate and the unbelievable speed with which concrete street paving was placed.

The supply was being taken through a main feeder (48 in.) from the N. Y. City (Catskill) supply under 78 lbs. pressure. Demand (anticipated) would reach a peak hour rate of 70 m.g.d., not counting fire drafts; 12 million total consumption on a maximum day; 7.6 million daily average—this supply coming in from 7 points of connection with the city's system. Mr. Eisner reviewed some of their experiences resulting from "bohunks" on the end of the nearest available wrench on fire hydrants. What happened to hydrant stems and what resulted from water hammer on mains laid in the marshy ground of the World's Fair site, was aplenty.

"W.P.A. Projects for the N.Y. City Department of Water" were hastily reviewed by PATRICK QUILTY, Acting Chief Engineer, Dept. of Water, Gas & Electricity, N. Y. City. The more important had been the extension of mains averaging 80 miles for each of the past 3 years. Cleaning and lining of 11 miles of a 21-mile span of 72-inch steel supply conduit had been completed—employing manual scraping and wire brushing and application of hot bituminous coatings also hand applied. The remaining 10 mile span was to be completed. Mr. Quilty named several other types of helpful W.P.A. assistance, amongst which were a very useful survey of water consumption by various types of consumers and on various types of premises—the data to be used in rate revisions and metering. Another project of major worth was that of mapping subsurface utility lines and other structures in the city.

"Fire Fighting Experiences," related by T. F. DOUGHERTY, Chief of the World's Fair Fire Dept., proved entertaining and thrilling in spots but had little or no bearing on water supply in fire-fighting.

"Stray Currents on Water Piping." The only topic of the "Round Table" was that introduced by FRANKLIN HENSHAW, Mgr., Scarsdale, N. Y., Water Department. In bringing up the question of "What Cost Grounding of Electrical Systems on Water Pipes?," Mr. Henshaw revealed some astonishingly large flows of electric current detected on house services in Scarsdale—from 4 to 10 amperes having been detected in the form of "leakage" through the ground connection onto the service pipes. Such had been as much of a surprise as the electric utility, one of the cases (10 amp. flow) proving to be leakage from the house wiring system which had entered the water pipe system by way of the metal wall lathing. At the time of the readings no power was being drawn in the house.

In the ensuing discussion it was pointed out that, contradictory to old beliefs, A.C. current would cause electrolysis; however, not as pronounced as D.C. current. That electrolysis of importance had occurred with self set up currents from joining of dissimilar metals. Such had been responsible for the de-zinking of brass piping, fittings failures, hot water boiler attack. In two recently reported instances sizeable amounts of lead had been dissolved from old lead services to which new copper tubing had been direct connected—resulting in lead poisoning. The trouble had been found to be due to aggressive water producing galvanic effects. The investigators who placed an insulating connection between the copper and lead pipes proved as much.

It was noted that there were two schools of thought in respect to electric grounding practice on water pipes, as distinct from electrolytic (self-made) currents. One reasoning was to do nothing to insulate but, instead, give the freest possible path to current flow out onto the water mains. Thus the tendency for current to accumulate and jump from the pipe to the water or the ground (the real damage effect) would be obviated. The other school of thought was to prohibit (if possible) grounding to water pipes, and in the meantime to provide a *good* insulating dam on the consumers' side of the water meter.

Here is where the fun started. For each method reasons were advanced. However, there appeared no wholly effective alternative (for the present at least), to grounding of house wiring systems on water pipes. The solution of the problem is yet to come from the investigations of the joint committee of the electrical men and the A.W.W.A., we hope.

SEWERAGE FINANCING

Modern Methods and Experience

By W. F. TEMPEST*
Chicago, Ill.

The Author

PRACTICAL methods of financing sewerage improvements are urgently needed and eagerly sought by hundreds of municipalities, large and small. General taxation is becoming less desirable and more difficult to apply. New sources of revenue must be found and it is only natural that for those functions of government that can be classed as utilities, the service charge should offer a means of providing the revenue for financing the improvement.

From experience and study of modern methods of sewerage financing, the merits of sewer rentals and sewer revenue bonds are being brought into sharp focus. There is immediate need for more factual data from municipalities which have had actual experience in formulating rate schedules for service charges and in the application of this method to financing with sewer revenue bonds. Experiences as outlined by Robert A. Allton of Columbus, in earlier issues of WATER WORKS & SEWERAGE, and by others, are of timely interest and should be of value to municipalities seeking the most practicable means of financing the needed facilities.

Enabling Acts

Although enabling acts for financing with sewer rentals and revenue bonds have now been passed in thirty-four states, the emergency nature of some of the acts makes necessary some clarifying amendments to broaden the scope of the borrowing power of municipalities. In a few cases the acts are not permanent but in those states consideration is being given to revision and passage of legislation that will be permanent. At least one state (North Carolina) at a special session of the General Assembly passed an act permitting issuance of revenue bonds, and this, in effect, renews the previous act which expired June 30, 1937.

Full appreciation of the benefits of such legislation is not yet general and even in many states with adequate legislative provisions, municipalities have failed to take advantage of it. More education is necessary to overcome theoretical arguments that are advanced against the use of sewer rentals and revenue bonds.

Sewer Rental May Be Charged Without an Enabling Act

It is desirable to have a clear definition of the terms "Sewer Rentals" and "Revenue Bonds." Sewer rental is a service charge made for use of the sewerage system and the treatment works. In some cases it is applied only to the treatment works, but its application to the entire sewerage system is becoming more general. The charges are usually made monthly or quarterly and paid by the user, not necessarily the owner of the property served. The revenue from such service charges is used to pay for operation and debt service in whole or in part. The sewer rental method may, in fact, be used to retire general tax obligation bonds, as described by Robert A. Allton in his article in this magazine discussing sewer rentals in Columbus, Ohio; or it may be used to retire other certificates of indebtedness. Its use is not confined to revenue bond financing and may be applied in states *without* enabling legislation for revenue bonds.

Revenue bonds are considered a form of municipal bond issued by a political subdivision for the purpose of constructing, acquiring or improving revenue producing works such as sewerage, sewage disposal and water works. Payment of such bonds depends entirely upon the revenue of the utility. The issuance of revenue bonds does not add to the bonded indebtedness of a municipality within the meaning of constitutional or statutory debt limitations. It is, therefore, possible for a municipality to finance improvements by this method when it would otherwise be impossible because of stringent limitations. However, as pointed out by prominent municipal bond houses, revenue bond financing should not be considered an easy entrance into debt for the improvident municipality. Although the full faith and credit of the political subdivision is not directly pledged as security for revenue bonds, the financial standing and debt history of the municipality will have an important bearing on the value and marketability of the bonds.

Referendum and Education

In many states it is possible to issue revenue bonds without a vote of the people. All that is necessary is a satisfactory bond ordinance passed by the council. Many have found it desirable, however, to ask for a referendum even though not legally required. When this is done it is important that the public be fully informed regarding the need for the improvement, its cost and the proposed service charge. Lack of an honest and intelligent publicity campaign may result in the defeat of a bond issue for an urgently needed improvement. An educational campaign is desirable regardless of whether a referendum is held or not. Publication of facts about the improvement and benefits to the municipality will react in many ways favorable to the city. General statements also will aid in giving the public, and especially investors, sim-

CITY OF EDWARDSVILLE, ILL.
SEWER SERVICE RENTAL

DOMESTIC RATES (NET PER MONTH)

Service Connection Minimum	$ .75
Up to 12,000 Gallons	.75
12,000 to 22,000 Gallons	1.25
22,000 to 32,000 Gallons	1.50

COMMERCIAL RATES (NET PER MONTH)

Service Connection Minimum	$1.50
Up to 15,000 Gallons	1.50
15,000 to 25,000 Gallons	1.75
25,000 to 35,000 Gallons	2.25
35,000 to 45,000 Gallons	3.25
45,000 to 100,000 Gallons	5.00

FLAT RATES (As Per City Ordinance No. 604)

Bills are payable to City of Edwardsville at City Hall. EDWARD H. POOS, City Clerk.

Note: If bill is not paid within 10 days after date below a 10 per cent penalty is added to net amount.

Date of this bill .....

Rental for this month .....

Amount forwarded .....

TOTAL AMOUNT .....

AMOUNT PAID .....

DATE OF THIS BILL .....

Note: When paying by mail please enclose this stub.

In Edwardsville, Illinois, this separate form of bill, printed on the back of a penny post card, is mailed to customers each month.

*Municipal Bureau, Portland Cement Association.

ple facts from which they gain some appreciation of the character of the municipality. Such facts will include growth of the community, industrial, business and residential, improvement programs, administration, debt control, tax rates, collections, particularly favorable experience in water and sewer bill collections.

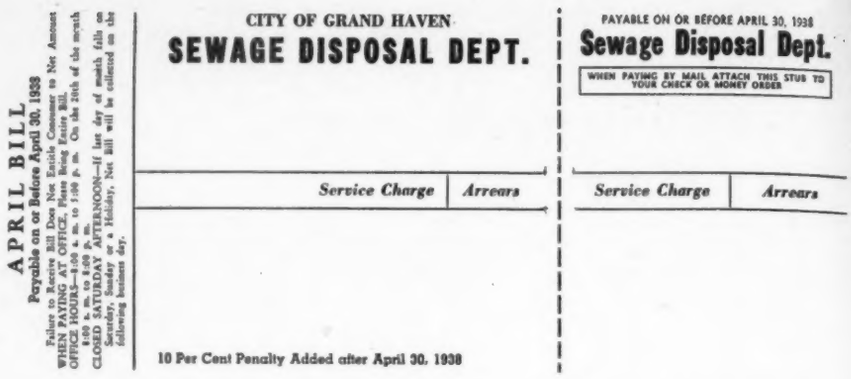
Billing and Collection Experiences

Reports assembled recently from municipalities in 17 different states showed 92 cities charging sewer rentals and in only two or three were there any difficulties reported with collections. Even so, the average uncollected balance of those reporting delinquencies was not as much as 5 per cent. A few reported mild protests on the first bills but these soon disappeared. In one case delinquencies were high due to protests at not having a referendum, and in another case there was disagreement between owners and renters on who should pay.

The billing method most preferred seems to be the monthly basis, and 50 per cent of the cities for which information was tabulated send sewer rental bills out monthly, most of the others quarterly or semi-annually. Six cities in Pennsylvania and one in Virginia reported annual billing.

The Rate Basis

The rate basis for the service charge in most cases was on the metered water consumption. In general this is the simplest and most equitable. The rate schedule should in all cases bear a relation to the use of water, even though the charge is assessed as a flat rate. Also general benefits should be considered when the charge is made on the basis of the water meter readings. There is a direct benefit accruing to the property from sewerage improvements and it is recognized that the owner should pay a certain share of the cost of the improvement. This charge may be made against the owner when connection is made to the sewer. Determining a rate schedule will also involve consideration of the character of the different areas served, that is whether domestic, business or industrial, and the quality of the sewage. The proper schedule of charges will necessarily have to be worked out for each specific case, and the municipal officials should give every possible assistance to the engineer in establishing a fair rate basis which will subsequently be incorporated in the rate ordinance.


APRIL BILL
Payable on or Before April 30, 1938
Failure to Receive Bill Does Not Entitle Consumer to Net Amount
WHEN PAYING AT OFFICE, Please Bring Entire Bill.
OFFICE HOURS—8:00 a. m. to 1:00 p. m. On the 20th of the month 8:00 a. m. to 5:00 p. m.
CLOSED SATURDAY AFTERNOON—If last day of month falls on Saturday, Sunday or a Holiday, Net Bill will be collected on the following business day.

CITY OF GRAND HAVEN
SEWAGE DISPOSAL DEPT.

Service Charge	Arrears

10 Per Cent Penalty Added after April 30, 1938

PAYABLE ON OR BEFORE APRIL 30, 1938
Sewage Disposal Dept.
WHEN PAYING BY MAIL ATTACH THIS STUB TO YOUR CHECK OR MONEY ORDER

Service Charge	Arrears

A separate bill is used by the Sewage Disposal Department of Grand Haven, Michigan. The rates, based on water meter readings, for quantity per quarter at monthly charge are as follows: Up to 5,000 gals., $0.50; 6,000 to 10,000 gals., $0.75; 11,000 to 15,000 gals., $1.00; 16,000 to 20,000 gals., $1.25; 21,000 to 25,000 gals., $1.50; 26,000 to 50,000 gals., $2.50; 51,000 to 100,000 gals., $4.00; 101,000 to 200,000 gals., $6.00; 201,000 to 500,000 gals., $10.00; 501,000 to 1,000,000 gals., $15.00; over 1,000,000 gals., $25.00

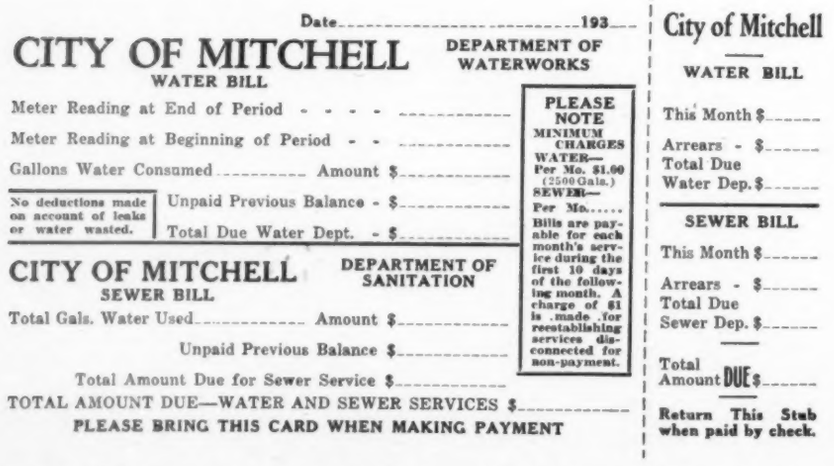
Legal Advice Important

The actual financing of the project should be discussed with a well recognized firm of bond attorneys and with bond houses specializing in municipal securities. Many bond houses now recognize the special merits of revenue issues and are steadily building up a market for sewer revenue bonds. With continued favorable experience with this type of bond its use should spread to a large number of municipalities in states having satisfactory legislation. So far the sewer revenue method of financing has been most popular in the mid-western states. It has been applied to a limited extent in some eastern states and a number of cities in the western and Pacific Coast states have shown a live interest and a desire to finance sewerage improvements with revenue bonds. No actual experience has yet been reported, however, from the far West.

Special Authorities Not Usually Necessary

In most cases where the sewer rental and revenue bond methods of financing have been used it has not been necessary to create new units of government. There is no basis for a fear that revenue financing will result in new overlapping units of government. It does, however, bring about a closer cooperation in the administration of the waterworks and sewerage divisions of the city. In this way it is possible to achieve economy, especially in billing and collections.

Where special "authorities" have been formed, peculiar conditions and circumstances were such as to make this form of administration the most advantageous. The unique quality and the high order of the executive work of these authorities where they were definitely needed has won the respect of those whom they serve and those with whom they deal. The formation of a separate corporation


Date_____193___

CITY OF MITCHELL
WATER BILL
DEPARTMENT OF WATERWORKS

Meter Reading at End of Period - - - - _____
Meter Reading at Beginning of Period - - _____
Gallons Water Consumed _____ Amount $_____

No deductions made on account of leaks or water wasted.

Unpaid Previous Balance - $_____
Total Due Water Dept. - $_____

PLEASE NOTE
MINIMUM CHARGES
WATER—
Per Mo. $1.00
(2500 Gals.)
SEWER—
Per Mo.....
Bills are payable for each month's service during the first 10 days of the following month. A charge of $1 is made for reestablishing services disconnected for non-payment.

CITY OF MITCHELL
SEWER BILL
DEPARTMENT OF SANITATION

Total Gals. Water Used _____ Amount $_____
Unpaid Previous Balance $_____
Total Amount Due for Sewer Service $_____
TOTAL AMOUNT DUE—WATER AND SEWER SERVICES $_____
PLEASE BRING THIS CARD WHEN MAKING PAYMENT

City of Mitchell
WATER BILL
This Month $_____
Arrears - $_____
Total Due Water Dep. $_____

SEWER BILL
This Month $_____
Arrears - $_____
Total Due Sewer Dep. $_____

Total Amount DUE $_____
Return This Stub when paid by check.

Mitchell, Indiana, sends out one billing card, but shows water and sewage charges separately.

or "authority" is a device to be employed only under special conditions. Its general adoption is not necessary for a wide and successful use of the sewer rental method, or for the increased use of revenue bond financing.

It is to the best interests of all municipalities to give serious consideration to these sound methods of modern sewerage financing. There is a tremendous need for greatly improved sewage treatment facilities in every state. A comparison of the number served by public water supply systems and those served by adequate sewage treatment works offers sufficient justification for the active work that is now being done to prevent pollution and safeguard water supply sources. Significant is the provision in the effective Pure Streams law in Pennsylvania that municipalities may not plead inability to finance since they now have the power to issue revenue bonds and establish adequate rentals.

This relatively new method of financing will be especially useful when federal grants for public works are materially reduced. It will enable municipalities to obtain needed facilities otherwise impossible without disturbing their existing fiscal program. Therefore the "Sewer Rental" method of financing sewage disposal deserves the careful consideration and study by all concerned. With the trend in the direction of consolidation of water works and sewerage departments of municipalities, water works managers should be especially interested in the modern and scientific method of financing through sewer rental collections.

Exhibits and Illustrations

Now will be presented some illustrations of how the method is employed and typical exhibits of billing forms.

The following significant recommendations of the Investment Bankers' Association concerning Special Revenue Bonds are taken from an extract which appeared in the Commercial & Financial Chronicle:

"Special Revenue Bonds:

"Reference is made to a resolution adopted by the Board of Governors on May 11, 1937, that part of which outlining specifications is as follows:

"That advertisements or circulars describing revenue bonds shall clearly indicate the nature of the obligation.

"That the customary form of the ordinary municipal circular and advertisement be varied to prevent confusion in the mind of the casual or careless reader.

"That the type of obligation be described clearly in the caption and with prominence consistent with that accorded to the name of the municipality.

"That priority of obligation, if any, be stated specifically.

"That the statement of assessed valuation, total debt, etc., if included, be given a secondary rather than a primary position.

"That in connection with such statement of assessed valuation, etc., a statement shall be made, and prominently displayed, to the effect that the assessed valuation reported is not subject to taxation for the payment of principal or interest of the bonds."

Bill for MUNICIPAL UTILITY SERVICE (Service of the Combined Waterworks and Sewerage System)
CITY OF ELMHURST, 132 Addison Ave., ELMHURST, ILLINOIS Tel. Elmhurst 1800
OFFICE HOURS: 8 A. M. TO 5 P. M.—WEDNESDAYS 8 A. M. TO 12 NOON

READING DATE FROM	READING DATE TO	METER READINGS PRESENT	METER READINGS PREVIOUS	WATER CUBIC FEET	QUANTITY CHARGE	GROSS BILL	Discount For Prompt Payment Only	PREVIOUS BILL UNPAID	TOTAL AMOUNT DUE
		SERVICE CHARGE (SEWAGE DISPOSAL) →							

QUANTITY CHARGE (Measured by Water delivered and based on one month's usage.)
Any portion of the
FIRST 4,000 Cubic Feet @ $2.25 per 1000 Cu. Ft.
NEXT 16,000 " @ 1.87½ "
" 60,000 " @ 1.50 "
All Additional " @ 1.12½ "
Minimum Quantity Charge .75 per Month

SERVICE CHARGE per month.
Single Family Residence $0.80
Duplex " " 1.60
Apartment and Office Bldgs. and similar class named in Ordinance, 40% of quantity charge.
For other classifications see Ordinance.

SAVE YOUR DISCOUNT—5% IF BILL IS PAID WITHIN 10 DAYS OF DATE. MAKE CHECKS PAYABLE TO CITY OF ELMHURST.

BILLS PAYABLE AT
CITY OFFICE, 132 ADDISON AVE YORK STATE BANK, 529 SO. YORK ST. HIERONYMUS DRUG STORE, 500 SPRING RD. OTTO'S GROCERY & MARKET, 675 W. ST. CHARLES RD.

One form of combined bill for water and sewerage utility service rendered monthly.

In this case the "Service Charge" for sewage disposal is on a simple fixed monthly basis, and is very nearly the same as the minimum "Quantity Charge" for water used.

A. B. Wood Made Superintendent of New Orleans Sewerage and Water Board

A. Baldwin Wood, Chief Mechanical Engineer of the Sewerage and Water Board of New Orleans, has been named its superintendent and chief engineer, succeeding the late Alfred F. Theard.

Mr. Wood long ago became famous as inventor and designer of the novel, and highly practical, pumps of the New Orleans drainage and sewerage system. The far famed units were the Wood Trash Pump and Wood Screw Pump. In addition he has many other important inventions to his credit. A native of New Orleans, he attended Tulane University and in 1899 (at 19 years of age) joined the Drainage Board of New Orleans. In 1908 he was placed in charge of all water, drainage and sewage pumping stations. Since 1920 Mr. Wood has held the position of chief mechanical engineer of the board. On good authority, he has repeatedly refused offers of many times more lucrative positions elsewhere.

In 1913 Mr. Wood announced his new Screw Pump and, after adequate proof of sustained performance, in 1929 saw giant units (14 ft. diameter discharge) successfully lift practically a half million gallons per minute each.

ANY ROOT OR ANY POWER OF ANY NUMBER

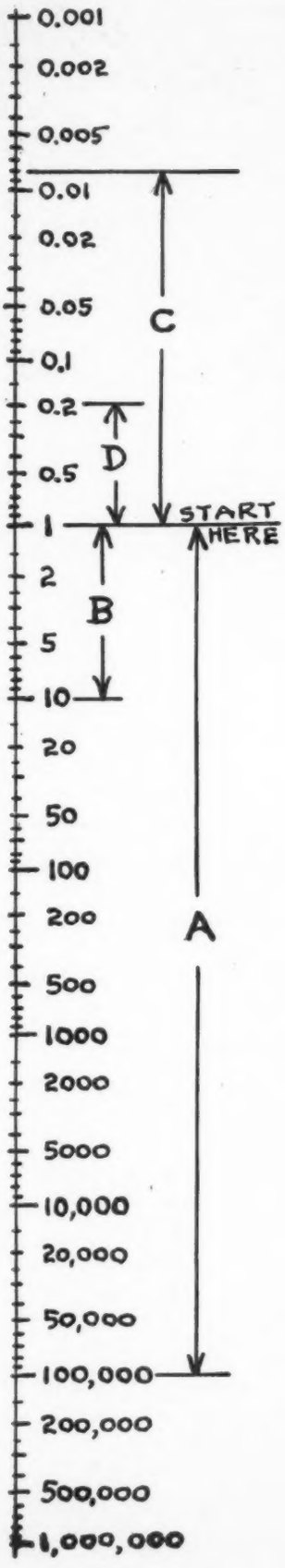
By W. F. SCHAPHORST, M.E.
Newark, New Jersey

SEVERAL years ago I wrote an article on this same subject which aroused considerable interest. But one letter which I received contained this comment: "The writer has just seen your chart for extracting any root of any number. If you will now tell us how to do the same with fractions and how to keep track of the number of digits in any case whether expanding to a power or extracting a root, we will erect a monument in your honor."

Whether or not this is a challenge, I do not know. If it is, I hereby accept the challenge. Not that I am looking for a "monument in my honor," but to show that it can be done and to give you something that I consider really valuable. I have prepared another chart which I trust will clarify matters for all time and which I am submitting herewith. Without doubt this is vastly superior to my previous chart. Besides, I doubt that anything like this has ever before been published. I shall tell you how I made it.

If you will take any slide rule and lay it end to end nine times, and each time lay off the principal dividing lines, you will have a chart exactly like this excepting that yours will be much longer and therefore it will be much more accurate. That is what I did in preparing this chart. Then I reduced it to this much smaller size. By following the above method you can make a chart that will go into the billions, trillions, or higher, as one limit; and a billionth, trillionth, or lower, as the other limit. There is no limit, in fact. Then to keep track of the digits you simply read the numbers exactly as they stand on the chart. No juggling of figures is necessary. I do not know of any other method that is as simple as this. All other methods require "juggling of digits," as they say.

For example, what is the 5th root of 100,000? Measure the distance A from 1 to 100,000 as indicated on the chart. The distance B must then be exactly 1/5th of the distance A and there is your answer, namely, 10. In other words, divide the distance A by the root and the quotient shows you the distance to measure from 1 to find the answer. Always measure from "1" in either direction. "One" is always the starting point. To extract the square, cube, or other root of fractions is usually more complex than extracting roots of whole numbers. However, with this chart one is just as easy as the other.



For example, what is the cube root of .008? Measure the distance C from .008 to the starting point "1" and divide it by 3 and you get the distance D which tells us that the answer is 0.2.

A method that is as easy as any to find a third, fourth, fifth, etc., of any distance, is to use a pair of dividers. Adjust the dividers until you get the distance D exactly 1/3 of the distance C and the chart gives the answer without any mathematical calculations whatever. With this chart you can determine the 3.127 power for instance—any power in fact. And you can extract the 4.37 root or any other root, all without mathematical jugglery. The "beauty" of it is: You have everything before your eyes in black and white.

No More Free Water in St. Louis

(Not Even for Fish, Says Director Wall)

The news flash sent out by the Associated Press on December 28 shows how tight the St. Louis Water Department is when it comes to free water. "Free water? No; not even for fish!" declared Director E. E. Wall. And so the headline in "AP" papers reads:

"2,500,000 Fish to Go on Relief"

The St. Louis Board of Public Service cannot understand why some 2,500,000 fish in the new St. Louis hatcheries, built under W.P.A., should be deprived of "free water."

Director of Public Utilities, Edward E. Wall, cannot understand why water for fish should not be paid for just as much so as for water ($6,000 worth per year) being supplied seals, "hippos" and polar bears in St. Louis' far-famed zoo. So, in go the meters and someone must pay the water bills for the fish in St. Louis. And now it looks like the 2,500,000 "poor fish" of St. Louis must go on relief.

LONG ISLAND SEWAGE OPERATORS

Close 1938 With Successful 18th Meeting

PRECEDED by inspections of three sewage treatment plants—to wit: those of Belgrave, Great Neck District, and the Village of Great Neck—the dinner and quarterly meeting of the humming Long Island Section of the New York State Sewage Works Association got under way at The Antlers near Port Washington, L. I.

Speakers and Chairman
Robert Best, Supt. Great Neck, L. I. (Puts paper in sewage, takes more out.)
James Hastie, Supt. Great Neck Distr. (Made a splendid Chairman.)
H. O. Johnson, Supt. Belgrave Distr. (Won a cup for excellent plant records.)

Above all else the L. I. Section is an operators' organization—run by and for operators. Remarkably successful, however, is this organization in getting mayors, commissioners and county health-officers out to its meetings, and with telling results which an improved understanding between official and operator has brought about.

At the December meeting the honored guest of the evening was the Honorable W. H. Bryant, Great Neck's mayor. In accord with the custom of having the local superintendent serve as chairman of his home meeting, the chairman of the meeting was James Hastie, Great Neck's Sewerage Superintendent. With prompter "Larry" Luther at his left to stay stage-fright and steer matters, Mr. Hastie (with a Scotch-burr) did a commendable job.

This being the final meeting of the year election of a new director, for the rotating Board, proved an order of business. Joseph M. Plant Supt. of Northport, L. I., proved the successful contender for that office. For the position of Secretary-Treasurer, L. L. Luther, who conceived and really runs the Section, was re-elected with acclaim and a vote of appreciation from the members.

After introductions of notables and guests, the technical session got under way on schedule.

Technical Sessions

"Operation of the Belgrave District Plant" was described by HERBERT O. JOHNSON, Supt. of sewers, in an exceptionally well prepared presentation of operating results (which reminded us of the fact that Mr. Johnson was one year winner of the award of the parent Association to the operator keeping the best operating records.) Mr. Johnson deals with a domestic sewage in a primary plant, productive of 61 per cent suspended solids removal and employing (at will) pre-post or split chlorination. He reported 0.9 cu. ft. of gas per pound of volatile matter destroyed (1.3 cu. ft. capita), requiring but 9 to 15 days in the digesters. In the Belgrave District suspended solids in the sewage vary between 8 and 400 p.p.m.; chlorine demand, 8 to 14 p.p.m.

Willis H. Bryant Mayor of Great Neck (Advocate of Good Operation)

Jos. M. Ketcham Northport, Supt. (Became a Brass Hat.)

Mr. Johnson's paper was discussed by T. R. RIDDICK (New York City), who is retained in connection with operation of the plant. Mr. Riddick explained how an optimum schedule for digested sludge drawings had been evolved, it having been determined that sludge should be left in the digesters until between 30 and 40 per cent volatile content (dry basis) had been reached. The basis for such was the speed of drainability and rate of moisture evaporation on the sludge beds. It was his belief that a similar index could be advantageously used at many plants, in order to realize fullest utility of sludge beds and digesters. He pointed out that sludge left too long or too short a time in digesters proved poor operating economy. Mr. Riddick also pointed out some deficiencies in "Standard Methods of Analysis," when it came to solids and volatile matter determination procedures. He also indicated how chlorine economy could be attained with more refined control and that a "Standard" for bacterial quality of chlorinated effluents was badly needed in order to avoid present waste of chlorine in producing perhaps needlessly high degrees of disinfection in many instances.

Programmers
John V. Fenton, Cons. Supt., Lynbrook.
R. K. Patterson, Johns-Manville Corp.
Clarence MacCallum, Cons. Engr., Mineola.

In answer to the latter suggestion, M. H. BIDWELL, of the N. Y. Dept. of Conservation, Freeport, L. I., replied that for shell-fish protection there could be no cutting of corners with chlorination. Since the margin between effective and deficient dosage was so slight, it had been found best to adhere to the "standard" which required the presence of residual chlorine in the effluent at all times. This, even though prechlorination be employed, which in turn provides contact periods of length which may not necessitate residual chlorine in the tank effluent *at all times.*

"Transite Pipes in Modern Sewer Construction" proved to be a movie showing the manufacture and in-

stallation of Asbestos-Cement Transite pipes in sewer construction at several places.

R. K. PATTERSON, Johns-Manville Sales Engineer, was on hand to explain the picture and answer many questions. Amongst advantages he cited long pipe lengths; few joints (of essentially bottle tight construction); lower gradient required than for terra-cotta pipes (1 ft. per 1,000 less), due to the very smooth tubular waterway and true walls. He said, it was true that "Transite" pipes cost more than terra-cotta on the basis of diameters, but there were the aforementioned values to be considered, the less the head to work with the greater the value of the smooth bore, and the leak less flexible joints.

"Eight Years With an Imhoff Tank" was an experience story by the Chairman, JAMES HASTIE, Supt., Great Neck Sewer District.

Amongst the lessons learned by Mr. Hastie were (1) that liming of gas vents was not as effective as drawing down sludge to correct foaming—"one ounce of elimination is worth several pounds of lime," being essentially what Mr. Hastie said. As to pH control, foaming had not occurred so long as pH 6.6 was maintained. Fighting scum in gas vents, by hosing down with fresh water, had been time consuming, costly and none too satisfactory. A portable pump, taking settling sewage for hosing operations, had been purchased. Results—hosing time cut from 3 hours to 1 hour, money saved, and vent scum less a problem for some reason. With it all Mr. Hastie remains a friend of the Imhoff tank for domestic sewages, and says so.

CLARENCE MACCALLUM, Designing Engineer, Mineola, L. I., enumerated the attributes of the Great Neck Imhoff tanks of deep design, but explained that now the removal of 60 per cent solids was insufficient since the County plant called for reduction in oxygen demand of 75 per cent and solids of 90 per cent, necessitating chemical treatment as a minimum requirement. In his opinion the Imhoff tank had served its day.

"Operation of a Modern Mechanical Plant" was described by ROBERT BEST, Supt. of Sewerage, Great Neck (Village), L. I., where vacuum filtration through a blanket of paper pulp reduces B.O.D. values 61.5 per cent and suspended solids 76.5 per cent on the average. The crude sewage (from 6 automatic pump stations) is pre-chlorinated, and the settling tanks are housed under glass to procure nuisanceless operation. Paper pulp consumption (the filter cake being incinerated along with cake from the vacuum sludge filter) amounted to 300 lbs./mg.

JOHN V. FENTON, Designing Engineer, Lynbrook, L. I., stated that Great Neck's mechanical plant had come up to all expectations in performance. Troubles with the vacuum sewage filters had been negligible. Labor and overhead costs per m.g. had been disappointingly high, because of the low flows in comparison with design capacity of the plant.

WM. G. HAM, for 22 years operator of the Imhoff tank plant of Port Washington, L. I., rose to say a good word for Imhoff tanks. Eight years' experience he said was "just a beginning," and he hoped to hear opinions expressed after another 14 years—to match his "associations" with the maligned Imhoffs for 22 years.

(Adjournment.)

E. A. JOHNSON PASSES

Edward A. Johnson, Vice President of the Pittsburgh Equitable Meter Company, died at his home in Bellevue, Pa., a suburb of Pittsburgh, Thursday evening, December 15, at the age of 58. A native of New York City, Mr. Johnson came to Pittsburgh in 1911 as general sales manager for Duff-Norton Manufacturing Company. In 1929 he joined the Pittsburgh Equitable Meter Company, and was well-known throughout the water utility field and gas industry of America.

Edw. A. Johnson

Mr. Johnson in April was elected Vice President of the Water Works Manufacturers Association. He had served as trustee of the old Central States Section and was made vice chairman of the new Western Pennsylvania Section of the American Water Works Association in recognition of his services. "Ed" Johnson was a past-president of the Rotary Club of Pittsburgh, a member of the Chamber of Commerce and the Masonic Order. He is survived by his wife, Maude E. Johnson, and two sons, Edward H. and Robert A. Johnson.

U. S. Now Boasts Near 4700 Sewage Treatment Plants

From a recent compilation of data supplied by state sanitary engineers, ENGINEERING NEWS RECORD reports that there are now upwards of 4,662 sewage treatment plants in the United States.

State comparisons reveal the largest number of plants (445) to be in Texas; with New Jersey's 263 second. In population served New York shows the largest number (5,539,000) and Illinois (4,822,000) second.

During the last three years the number of people served by sewage treatment plants has increased by the noteworthy figure of 52 per cent. To bring this about 1,200 new plants were added in the same three-year period, largely due to the impetus of P.W.A. and W.P.A. programs, and activity of State Sanitary Engineers. Total population served is now 40,885,000, representing about half the urban U. S. population.

Spartanburg Lets Contracts for Water Supply Improvements

Three contracts awarded last month by the Public Works Commission of Spartanburg, S. C., with P.W.A. assistance, totalled almost $250,000. The largest single contract was that for 16,000 ft. of 20 in. steel pipe and 39,830 ft. of 34 in. steel pipe, at a cost of $181,818.80. The pipe installation contract amounted to $59,738, and that for valves, valve boxes, check valves, etc., being $4,389.

A rather unique method was used in taking pipe line bids—namely, that steel pipe bids, to be considered, must be such that the completed pipe line cost at least 20 per cent less than a line of bituminous lined cast-iron pipes. The bids on steel pipe resulted in a completed job 24.4 per cent under the figure for cast-iron.

Bids will be taken on the new filter plant under design about March, at a cost of between $150,000 and $200,000, according to R. B. Simms, Supt. of Water and Sewerage. On the projects, which involve P.W.A. grants of some $625,000, Wiedeman and Singleton of Atlanta, Ga., are retained as consultants and approving engineers.

The Editor's Comments

1938's WATER SUPPLY PROGRESS

IT HAS for the past several years been the policy and privilege of this magazine to publish, in the first two issues of each new year, reviews of progress made and trends indicated in the two fields covered—water supply and sewage disposal. We have been fortunate in securing, as the annual reviewers, leaders in the field who also possess the gift of writing in an interesting and meaty style. This year is no exception.

Featured in this issue is the review of "Water Supply Progress," which comes from the pen of a former operating head of an important chain of water works plants, now a consultant practicing under his own name and this year's president of the American Water Works Association.

Perhaps what may seem the most impressive part of his review is that which names the more important projected water supply undertakings of the year, and reveals in brief outline the nature of each. Without much question, the amount of money to be involved in new water supply projects and betterments is eye-opening. To us, however, an equally impressive chapter in recent progress is the great number of *new* public water supply works which have been installed in the small communities of this country. In both the large and the small projects we realize that without the governmental assistance, rendered through the P. W. A. and the W. P. A., such a progress picture could not have been drawn. In truth, we must say that this is progress under development, and represents expenditures and betterments to come in 1939, which can in 1940 be reported as developments of 1939. From the latest authentic figures available it seems that of the 1,032 water supply projects which received P. W. A. approval, for the 45 per cent grant and 55 per cent loan, only 642 have met the final requirements or dead-line dates and are thereby assured. Possibly it is fair to assume then that there are at least half, say 200, of the other 390 projects, approved but failing to mature to date, which may serve as a reserve in the water supply "business reservoir" for "drought alleviation" following the flush years of projected 1939 and 1940 construction. However, on the 642 assured projects (water supply alone) the tidy sum of $114,000,000 is to be spent. Certainly, that is not to be sneezed at in the way of progress, whether projected or otherwise. This then is the most spectacular feature of the review of 1938 and outlook for 1939 and 1940.

In respect to past betterments to water supply systems and new works, we find some interesting reading in one of the recent P. W. A. statistical analyses, made to indicate the relative importance of the several types of construction that it has been fostering. It finds that although road and street construction has given the greater number of man-hours of employment per million dollars expended, water supply projects have proved a very close runner-up. In respect to the percentage of the total expenditure which has gone to industry (equipment and material manufacturers), and therefore employment away from the site, water supply projects took the lead, $604,000 for each $1,000,000 spent going to industry for materials. Not far behind, and considered the next most important in the P. W. A. program, have been the sewerage projects, in which $509,000 out of every $1,000,000 spent went for materials and equipment.

Then we find some interesting facts in the breakdown to reveal which industries profited most. Considering the number of plants built or enlarged and the miles of sewers constructed, it is somewhat of a surprise to learn that in sewerage projects for every $1,000,000 spent for cement, better than $3,600,000 went into iron and steel products, not counting pumps, motors, engines, or plumbing supplies.

In looking at developments and trends in water treatment, the recent departures upwards from the antiquated standard of two gallons per square foot per minute in filtration and softening is amongst the most significant developments. Such is indicative of a trend in the direction of economy without jeopardy to technical soundness in modern purification practice. In this, and in many other respects, the new plants at Springfield, Ill., and the St. Louis (Mo.) County Water Co. may be cited as outstanding examples of economic soundness coupled with technical prowess. This leads to some comment on recent notable developments in improving the technic and economy of lime-soda softening, as exemplified in adaptation of the principle of sludge return, split (over) treatment and the de-colloidizing effects procured by the floating blanket of precipitate. To us this development is history making. In addition to chemical savings and marked reductions in initial plant costs, the expensive "back-stepping" process of re-carbonation appears now to be distinctly on its way out in most cases.

As to strictly chemical treatment: For the development of the year the blue ribbon must be handed to those who are responsible for the development and adaptation of hexa-meta-phosphate treatment. The technic and attributes of the method are revealed in a special article in this issue by authors Hoover and Rice; are prominently mentioned by reviewer Newsom; and have been the chief topic of discussion recently amongst leading water supply chemists. In addition to curing the "headaches" of recarbonation, encrustation and corrosion, the adaptation of hexa-meta-phosphate treatment (dubbed "Threshold Treatment") bids fair to lead the water treatment "Moses" out of the "Wilderness" of perplexity concerning how to make lime treatment in corrosion control do a job where most needed—namely, out on the far reaches of the pipe system.

Silicate treatment as a "catalyst" in coagulation, while not a development of 1938, has given a good account of itself in water treatment economy during the year, particularly in connection with "difficult" waters. In addition, use of the process has extended over into chemical precipitation of sewages and wastes, with even more decisive benefits. In water and sewage the adaptation of iron coagulants has also progressed soundly.

In corrosion control we are still at it and many of us continue to be perplexed to find that water conditioning, by lime treatment to raise the pH value, is not the completed answer. We stop red-water but the tubercles continue to grow—perhaps more slowly, but they do grow and raise the cost of pumping and reduce pipe capacities surprisingly easily. As one chemist has put it, maybe the new hexa-meta-phosphate treatment "is the answer to a maiden's prayer." Sight cannot be lost of the worth of cathodic protection, and in this direction the development of the year is the application of the method in effectively protecting interiors of steel tanks.

L. H. Enslow

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Be Sure To Demand

- ACCURACY
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- MODERN APPEARANCE

Regardless of whether your problem calls for the use of a Venturi Tube, Weir, or Flume, you can depend on Bailey Meter Company to design and construct both the primary element and the register for maximum accuracy.

A vast amount of experience gained from thousands of installations of metering equipment, together with extensive experimental work in our own hydraulic laboratory and in the laboratories of the Ohio State University, Cornell University, Case School of Applied Science and other institutions, is back of every Bailey Primary Element.

The reliability of Bailey Meters and Recorders is attested to by the fact that thousands of dollars worth of steam and water are sold monthly and billed solely on the basis of readings from Bailey Meters.

No small share of the accuracy and reliability of Bailey Meters is due to the conservative engineering policy of the Company. New ideas and designs are not offered for sale until they have been thoroughly tested both in the laboratory and in actual service.

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Write for your copy of Bulletins No. 301 and 302, describing Bailey Fluid Meters for steam, liquids, gases, sewage, sludge, and compressed air.

MU-16

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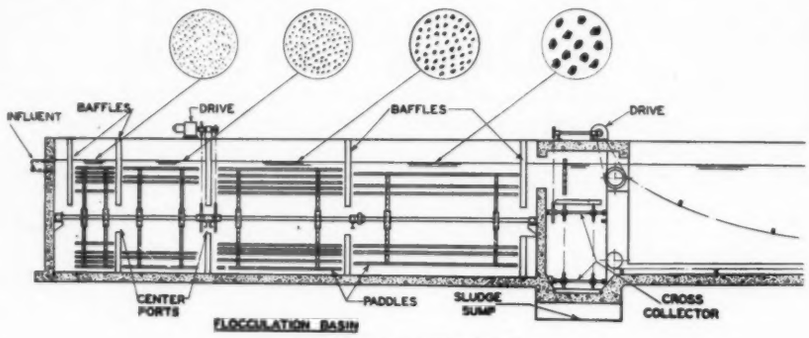
EQUIPMENT NEWS

New Flocculating Device

● The Jeffrey Manufacturing Company recently announced a new flocculating process and apparatus known as the Jeffrey "FLOCTROL." It is designed for more efficiently coagulating waters, sewages or trade wastes, and improved water softening. The manufacturer is licensed under the Langelier patents covering the process and method.

The flocculating unit fits in a rectangular multi-compartment chamber, paddle wheel revolving in each separate compartment as illustrated. The complete baffling arrangement is designed to preclude short circuiting. In the first zone (compartment) mixing with a short multi-bladed wheel is rapid but brief. Each succeeding compartment provides a gradual slowing down of the mixing velocity to an effective flocculating velocity at the outlet end—the paddle wheels in succeeding compartments being designed to attain such. The flow travels in the direction of the center shafting on which all paddles are attached. Each succeeding compartment provides a longer period of detention with the slowing velocities.

"FLOCTROL" units are furnished singly for flows up to 10 m.g.d., and in multiples for larger plants. This new device, and process, is more adequately described and illustrated in Bulletin 694. For a copy write The Jeffrey Mfg. Co., Columbus, Ohio.



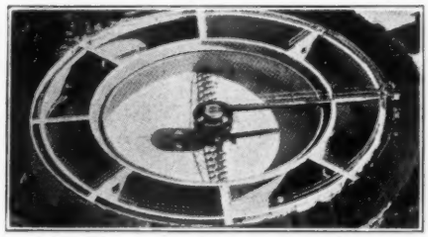
The Jeffrey "Floctrol"

The Currie "Claraetor"

● The Dorr Co. is offering the unique Currie "Claraetor," which receives its name from the inventor—Frank S. Currie, Consulting Engineer of San Bernardino, Calif. Being a tank built within a tank, it reminds one of the novel and economical Morse Filter Plant composed of concentric tanks and developed by another capable sanitary engineer.

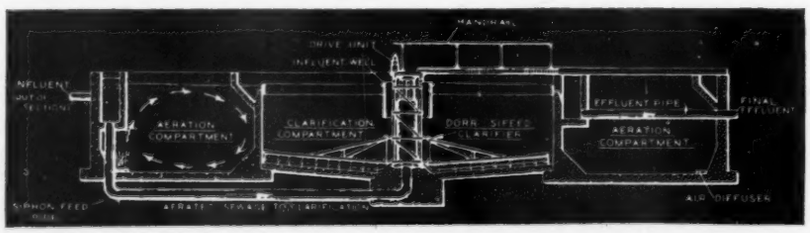
Developed for adaptation of the activated-sludge process for communities of small and medium size, the "Claraetor" provides a compact, self-contained and low cost unit for clarification and aeration in a single circular tank of two compartments. In the annular outer compartment aeration takes place. The liquor then enters the center compartment which serves as a center-feed clarifier, equipped with Dorr's Sifeed Clarifier Mechanism.

The "Claraetor" has been successfully adapted now in several sewage treatment plants where its merits and economy have been amply demonstrated, operating results being equal to those from conventional multi-unit activated sludge plants.



An Installation

The Dorr Company has recently issued a special leaflet No. 6581-C describing this unique sewage treatment unit and depicting its advantages. Certainly it is attractive to look at and easy to beautify. For the leaflet on the Currie "Claraetor" write The Dorr Co., Inc., Engineers, 570 Lexington Ave., New York, N. Y.

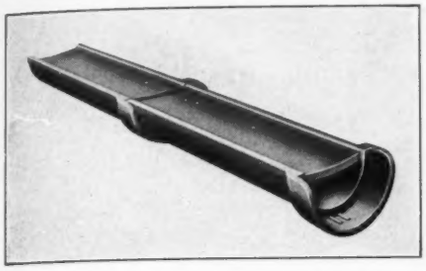


Dorr Co.'s New Unit for Clarification and Aeration

New Underdrain Pipe

● A radically new design in vitrified clay underdrain pipe has been announced recently by The Robinson Clay Product Company. Such is now on the market under the name: "Robinson Skip-Pipe."

This new underdrain, of bell and spigot type, is semi-circular in shape.



Robinson Vitrified Underdrain Pipe

A superimposed cradle is an *integral part* of the pipe, and is somewhat shorter than the entire length to provide openings for extra-rapid drainage under all operating conditions.

In addition to its use as a filter underdrain, "Skip-Pipe" is designed for use on many types of drainage jobs, including cellars, trenches, foundations. "Skip-Pipe" is available in five sizes from 4 to 12 inches.

The manufacturers claim that its advanced design makes the new pipe superior in performance to any other type of underdrain, at low heads as well as high heads. Substantiating tests, conducted by Charles M. Allen, Professor of Hydraulic Engineering at Worcester Polytechnic Institute, reveal that "Skip-Pipe" starts flowing before other type of pipes, and continues discharging after other pipes have ceased. The tests also show that the discharge of the half-round pipe (at capacity) is equal to that of full round pipe.

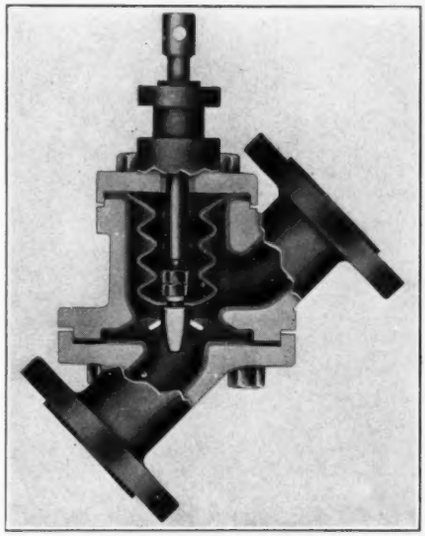
Complete information, specifications and dimensions of Robinson "Skip-Pipe" are contained in a new illustrated catalogue. This catalogue also contains reproductions of the original charts prepared by Professor Allen, showing the results of comparative tests of various types of underdrains. Designated as No. UD-2, a copy of the new catalog may be secured by writing The Robinson Clay Product Co., Akron, Ohio.

New Control Valve for Ferric Chloride

● A flow control valve designed for highly corrosive solutions has been developed by Hasco Valve & Machine Company of Milwaukee.

Although the valve was designed primarily for regulating the flow of ferric-chloride solution, it can be used with other acidic solutions, but not with strong alkalis. It is completely lined with live rubber, except for the seat and plug, which are tantalum. The seat is a tantalum ring which is firmly vulcanized into a rubber seat ring. The latter, in turn, is clamped into place by the upper and lower halves of the valve body, permitting easy removal for inspection and cleaning. The rubber lining is applied by The Goodyear Tire & Rubber Company.

The metal stem supporting the tantalum plug is protected by a rubber bellows. This construction removes the need for a gland and packing, thus making its action extremely smooth and sensitive. The manufacturer reports that the type of construction was proved by a test valve which operated for eight months in one of Chicago's sewage treatment plants. The Hasco Flow Valve is made for regulating purposes *only*. It is not a shut-off valve.



New Hasco Flow Control Valve

The new valve is designed to be operated by an Askania ratio regulator.

For descriptive literature on this novel valve write Hasco Valve & Machine Co., 1819 W. St. Paul Ave., Milwaukee, Wis.

National Meter Enlarges Chicago Personnel

(D. R. Gannon Joins Staff)

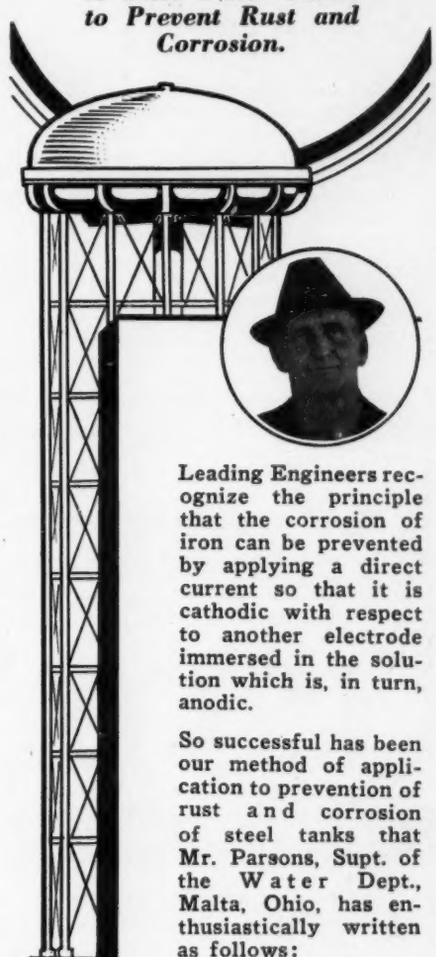
● N. J. Kenny, president of the National Meter Company, has just announced the addition to its Chicago branch sales organization of Mr. Dan R. Gannon, Jr., who has been associated with the water works industry for the past 15 years.

D. R. Gannon

Since 1929 Mr. Gannon represented the Mueller Co. of Decatur, Ill. He majored in Hydraulic Engineering in the Universities of Montana and California, and is especially well fitted by experience and training to take over his new duties with National Meter.

Now!

Well-Known Method of Cathodic Protection Is Successfully Applied to Steel Water Tanks to Prevent Rust and Corrosion.



Leading Engineers recognize the principle that the corrosion of iron can be prevented by applying a direct current so that it is cathodic with respect to another electrode immersed in the solution which is, in turn, anodic.

So successful has been our method of application to prevention of rust and corrosion of steel tanks that Mr. Parsons, Supt. of the Water Dept., Malta, Ohio, has enthusiastically written as follows:

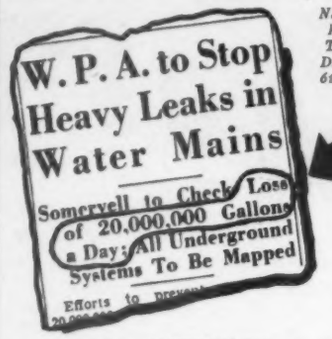
"I recommend this system to anyone; our tank was twelve years old and was terribly rusty on the inside. After having your system installed for only three months, we drained our tank and found it as clean as a new bucket."

Let us do the same kind of a job for your tank.

Write for literature giving full details.

ELECTRO RUST-PROOFING COMPANY

434 Gunckle Avenue Dayton, Ohio


W. P. A. to Stop Heavy Leaks in Water Mains
Somervell to Check Loss of 20,000,000 Gallons a Day; All Underground Systems To Be Mapped
Efforts to prevent

New York Herald-Tribune, December 6th, 1938

Where Tegul-MINERALEAD is properly used for jointing bell and spigot main, there are no leaks. The unavoidable INITIAL leakage stops almost at once when this sulfur base compound goes to work • Because this ingot form compound heals at once, backfilling of trenches can proceed immediately, doing away with traffic hazards • The ingot form can be stored in the open—rain, snow and flood won't harm it—and it is easy to handle and ship • Properly mixed at factory, it cannot change composition en route to you • May we tell you how Tegul-MINERALEAD saves money, time and trouble in your jointing jobs. Write The Atlas Mineral Products Company of Pa., Mertztown, Pennsylvania.

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FERRIC CHLORIDE

For Sewage and Water Treatment Have You Tried—

ISCO

FERRIC CHLORIDE Solution or Crystal?

FOR SLUDGE CONDITIONING—Ferric Chloride has been accepted as the most efficient agent from the standpoint of performance and cost.

FOR COAGULATING SEWAGE — Ferric Chloride provides an inexpensive and effective method of dealing with plant overloads.

FOR WATER FILTRATION — Ferric Chloride is an economical and practical coagulant. It gives a quick-forming, fast-settling floc.

INNIS, SPEIDEN & CO.

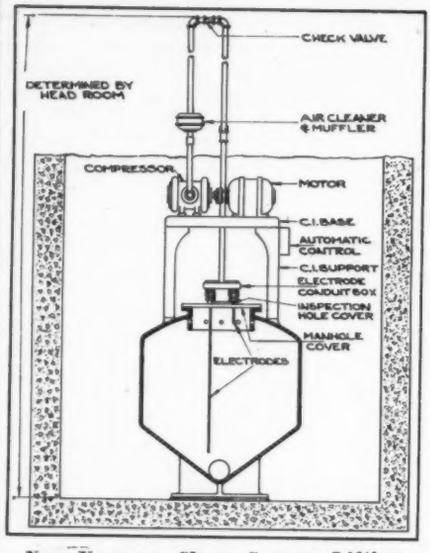
117 LIBERTY STREET, NEW YORK, N. Y.

Chicago Cleveland Boston

Philadelphia Gloversville, N. Y.

A "Package" Sewage Lift Station

● Something new in pneumatic ejector stations is the Yeomans-Shone "Package" Sewage Lift Station—a complete unit for lifting sewage or drainage in municipal sewerage or institutional sewage systems or large buildings.



New Yeomans-Shone Sewage-Lifting Unit

The new "Package" Station makes use of the well known Shone Ejector, but represents a more compact ("package") design and results in a lower cost of installation. It offers the advantages of the pneumatic ejector at a cost comparable to that of a station employing centrifugal pumps. Free from moving parts, in or on the collecting chamber, there can be no clogging or jamming. Mounted on the receiver (collecting chamber) is a rotary type air compressor, which furnishes the compressed air for ejecting the sewage. There is no air storage tank, and this new compact "Package" unit is ideal for underground lift stations or those in outlying districts where attendance and maintenance is a problem.

Bulletin 4100 presents illustrated details and specifications. For a copy write Yeomans Bros. Co., 1433 Dayton St., Chicago, Ill.

Albert Hargett Joins Ford of Wabash

● John L. Ford, Secretary-Treasurer of The Ford Meter Box Co. of Wabash, Ind., has announced the appointment of Albert E. Hargett as sales and service engineer of this company.

Albert Hargett

A native of Baltimore, Mr. Hargett took the Civil Engineering Course at Johns Hopkins University, after which (1922) he was appointed Junior Civil Engineer in the Distribution Division of Baltimore's Bureau of Water Supply.

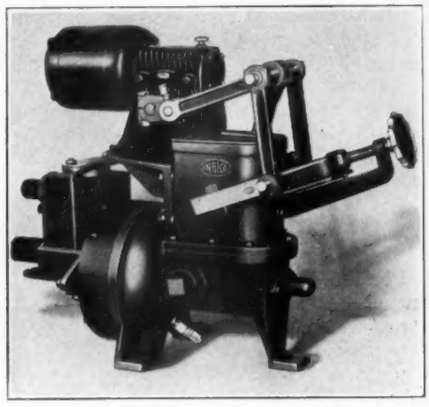
In 1928 he went with the Union Water Works Company as superintendent of its properties at Glasgow and Horsecave, Ky. Since 1930 he has been manager of the Riverton-Palmyra (N. J.) Water Co. and has served as district manager for seven affiliated plants in New Jersey.

New Plunger-Diaphragm Proportioning Pump

● A new solution feed pump for volumetrically measuring and pumping acids and other clear corrosive chemical solutions has been announced by International Filter Co., of Chicago.

This new plunger-diaphragm pump, known as "Infilco Type DP," is a means of both accurately measuring a solution and pumping it to the point of application. It was designed for the treatment of water, sewage and trade wastes.

Action of the Type DP is simple and positive. The plunger of the displacement pump actuates a rubber diaphragm through means of a transmission liquid, and the diaphragm in turn, with the solid rubber pumping chamber and valves, actually handles the solution. The liquid comes in contact only with rubber.



Infilco Type DP Pump

Any of the transmission liquid that slips past the piston rings is automatically returned through a compensating valve mechanism, assuring sustained accuracy. The transmission liquid is a non-conductor of electricity; should the solution being pumped leak past the diaphragm it would instantly change this transmission liquid to a conductor, close an electrical circuit and sound a warning.

Because it is a positive displacement pump, the manufacturer states that the type DP will work under conditions of both suction lift and discharge head with a high degree of accuracy.

In a new bulletin the "Infilco Type DP" pump is completely described. For a copy write International Filter Co., 59 East Van Buren St., Chicago, Ill.

MEETINGS SCHEDULED

Jan. 18-20—NEW YORK CITY, N. Y. (Eng. Soc. Bldg.)
American Society Civil Engineers. Sec'y, Geo. T. Seabury, 33 West 39th St., New York City.
(Jan. 19—Sessions and Joint Dinner of the Sanitary Engineering Division and N. Y. State Sewage Works Ass'n.)

Jan. 19-21—NEW YORK CITY, N. Y. (Hotel McAlpin)
New York State Sewage Works Ass'n. Sec'y, A. S. Bedell, State Board of Health, Albany, N. Y.
(Jan. 19—Joint Annual Dinner with San. Eng. Div. of A.S.C.E.)
(Jan. 21—Joint inspection trip with San. Eng. Div. of A.S.C.E.)

Jan. 19—BOSTON, MASS. (Statler Hotel)
New England Water Works Association. (Monthly Meeting.) Sec'y, Frank J. Gifford, 613 Statler Bldg., Boston, Mass.

Feb. 7—NEW BRUNSWICK, N. J.
New Jersey Section A.W.W.A. Sec'y, Prof. H. N. Lendall, Rutgers, University, New Brunswick, N. Y.

Feb. 16—(February meeting of N.E.W.W.A.)

Mar. 9-10—TRENTON, N. J. (Stacy-Trent)
New Jersey Sewage Works Association. (24th Annual Meeting.) Sec'y, John R. Downes, Supt. Sewage Treatment Works, Bound Brook, N. J.

Mar. 16—(March meeting of N.E.W.W.A.—See above)

Mar. 30-31—N. Y. SECTION, ROCHESTER, N. Y.
Sec'y, R. K. Blanchard, 50 W. 50th St., New York City.

April .—PHOENIX, ARIZ. (Hotel Adams) (Date not set)
Arizona Sewage and Water Works Association. Sec'y-Treas., P. E. Mauzey, City Hall, Phoenix, Ariz.

Apr. 10-12—MEMPHIS, TENN. (Peabody Hotel)
Kentucky-Tennessee Section A.W.W.A. (Tentative.) Sec'y-Treas., H. D. Schmidt, State Dept. Health, Nashville, Tenn.

Apr. 12-14—TORONTO, ONT. (Royal York Hotel)
Canadian Section A.W.W.A. Sec'y-Treas., A. E. Berry, Ontario Dept. of Health, Parliament Bldgs., Toronto, Ont.

Apr. 17-19—
Southeastern Section A.W.W.A. Sec'y-Treas., B. P. Rice, State Board of Health, 422 State Office Bldg., Columbia, S. C.

Apr. 25-26—INDIANAPOLIS, IND. (Antlers Hotel)
Indiana Section A.W.W.A. Sec'y-Treas., J. A. Bruhn, Indianapolis Water Company, 113 Monument Circle, Indianapolis, Ind.

Apr. 27-28—DAYTON, OHIO (Van Cleve Hotel)
Ohio Section A.W.W.A. Sec'y-Treas., T. R. Lathrop, State Dept. of Health, Columbus, Ohio.

May 3-6—COLUMBIA, S. C. (University of South Carolina)
South Carolina Short School. Sec'y, B. P. Rice, State Sew. Engr., 422 State Office Bldg., Columbia, S. C.

May 18-20—TACOMA, WASH.
Pacific Northwest Section A.W.W.A. Sec'y-Treas., Fred Merryfield, Assoc. Prof. San. Eng., Oregon State College, Corvallis, Oregon.

June 11-15—ATLANTIC CITY, N. J. (Hotels Ambassador and Chelsea—Registration, Meetings, Exhibits in Auditorium)
American Water Works Association. (59th Annual Convention.) Sec'y, Harry E. Jordan, 22 East 40th St., New York City.

June 26-28—STATE COLLEGE, PA. (Nittany Lion Inn and Dormitories.)
Pennsylvania Sewage Works Ass'n. Sec'y-Treas., L. D. Matter, Distr. Eng'r., Kirby Health Center, Wilkes-Barre, Pa.

June 28-30—STATE COLLEGE, PA. (Nittany Lion Inn and Dormitories)
Pennsylvania Water Works Operators' Association. Sec'y-Treas., I. M. Glace, 22 South 22nd St., Harrisburg, Pa.

DOW FERRIC CHLORIDE

38-45% SOLUTION TANK CAR SHIPMENT

60% CRYSTALS PACKED 300 LB. AND 500 LB. BARRELS

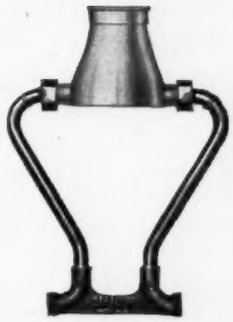
Chosen by leading municipalities as the ideal economical coagulant for sewerage treatment and water purification.

Complete technical data available upon request. Quotations gladly furnished for immediate delivery or for estimating purposes. Write for information today.

THE DOW CHEMICAL COMPANY
MIDLAND MICHIGAN

TRADE DOW MARK

Ford Resetters



Ford RESETTERS simplify the raising of too-low water meters. They are easy to install and use.

RESETTERS are all brass and copper. They make permanently convenient water meter settings.

Before resetting.

The RESETTER connects between old meter couplings,—the meter being reset between the flanged copper tubes. Write for information.

After resetting.

Ford Meter Box Co.

SETTING AND TESTING EQUIPMENT FOR WATER METERS
WABASH, IND., U.S.A.

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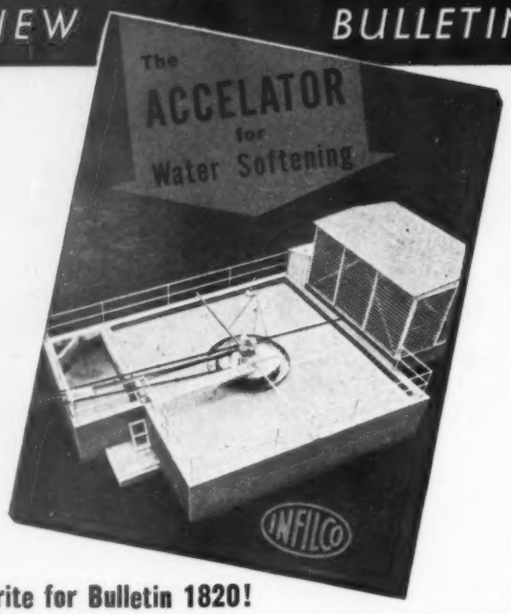

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Catalogs and Literature Received

"Plastex Protective Coatings" is a brochure from the Steel Protection and Chemical Company of Mooresville, Ind., which describes this manufacturer's plastic coal-tar base coatings and enamels for water and sewer pipes. Marketed under the trade name "Plastex," specifications presented indicate that these enamels will not crack, check or lose bond over a range from minus 40 to 200 degrees Fahrenheit. Recommended uses of the several coatings and points of application are tabulated for iron, steel and concrete pipe, tanks, etc., also for waterproofing of walls and as roofing material. Typical applications are pictured, including those of Hot-Pour "Plastex" Joint-Seal, and the interesting "Plastex" Joint Seal Putty for sewers and repairs. For a copy of "Plastex" write Steel Protection and Chemical Co., Inc., Mooresville, Ind.

"Byers Wrought Iron Products" are presented in a new 55 page General Catalog from A. M. Byers Co., of Pittsburgh, which provides complete mechanical information on Byers' products. Genuine wrought-iron is clearly defined as to composition structure and qualities, and specifications are outlined for steel and wrought-iron. It is noted that Byers offers steel pipe in addition to wrought-iron pipe. Also directions to follow in placing orders for pipe, well casings and other tubular products are set forth. Many pages are devoted to dimensions, weights, wall thickness of Byers' full line of tubular products, roofing plates, and the like. The new catalog is wire bound (8½x 11 inches), well indexed and easy to use. For a copy write A. M. Byers Co., Pittsburgh, Pa.

"Safety Tools" which do not spark in use, as ordinary steel chisels and tools do, are presented in a folder from The Berylium Corporation, of Reading, Pa. These safety tools, which should be of great interest to managers of sewage works, are made of a Berylium-Copper alloy which is tempered by heat treatment to hardness and strength of the best steels. These "Safety Tools" have long been used in industrial plants, where chiseling or hammering with steel tools might produce sparks and explosions. A variety of chisels, scrapers, hammers, wrenches, and even wire brushes now available in the non-sparking alloy, are illustrated and described. It would seem that every sewage works manager should be interested in this type of tool. For the folder "Safety Tools" and price list, write The Berylium Corp., Reading, Pa.

"Flexible Metal Hose" is finding an increasing variety of uses and applications. As much is proven in "The Fact Book of the Flexible Metal Hose and Tubing Institute," which tells a factual story of the products it promotes. The illustrations give a clear idea of the variety of uses to which the flexible products may be adapted in the industrial and utility fields. One picture shows two sections of 12 in. diameter flexible hose in pipe lines. Other pictures reveal successful vibration dampening with such hose as exhaust and intake lines to Diesel engines. Still another shows its application for gas lines, and in other places where expansion and contraction must be absorbed. Safety is one of the chief attributes of flexible metal hose for steam lines. For a copy of "The Fact Book" write The Flexible Metal Hose Institute, 150 Broadway, New York City.

"Through-Conduit Lubricated Valves" are described and their advantageous features clearly illustrated in a catalog from the W-K-M Company, Inc., of Houston, Texas. The outstanding feature of this novel lubricated valve, perfected and thoroughly proven for the oil industry where sludge accumulation in valves is a problem, is the fact that when the valve is in the open position a real "through-conduit" is presented. There are no cavities and no exposure of seats or other internal parts of the valve in closed or open position. It is impossible, thereby, for debris to accumulate and prevent such valves from closing tight or opening properly. Specifications and price lists appear in the catalog. On the catalog cover appears the slogan, "It's Different!" and elsewhere the statement, "Costs No More Than Ordinary Valves." For this catalog of "The Valve That's Different" write W-K-M Company, Inc., 220 Roberts St., Houston, Texas.

"Gruendler Hammer Mills," for grinding anything from limestone to sewage screenings or sludge cake, are described in a folder from Gruendler Crusher and Pulverizer Company of St. Louis, Mo. The Gruendler "2 in 1" unit has a crushing range from 2½ in. rock down to dust. Also illustrated and described are Gruendler Jack-Leg (Elevated) Steel Bins for truck loading. If interested in hammer-mills or bins write Gruendler Crusher and Pulverizer Co., 2917 N. Market St., St. Louis, Mo.

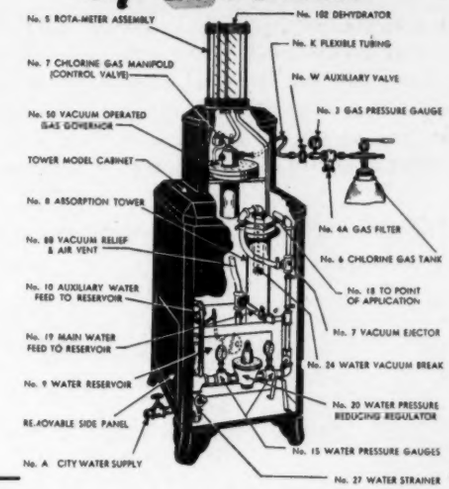
"Bin-Type Retaining Walls" are illustrated and described in a 16 page bulletin from ARMCO Culvert Mfrs. Assn. For stabilizing or confining earth embankments this type of "cellular" retaining wall is announced as an outstanding improvement over cribbing or monolithic walls. The new feature, stressed, is the heavy U-shaped column construction, with stringers and spacers securely bolted to these rigid columns. Erected, these structures form a series of connected bins that are completely closed on all four sides. Amongst advantages listed are: allow year-round construction; ease of installation by unskilled labor; free drainage; 100% salvage value. General installation procedures are described and illustrated, as are a number of typical uses. For a copy of "ARMCO Bin-Type Retaining Walls," write Armco Culvert Mfrs. Assn., Middletown, Ohio.

"Welding"—Procedure for producing all types of welds, and for applying surfacing metal to meet any type of wear-action, are given in a new helpfully illustrated bulletin just received from The Lincoln Electric Company, Cleveland, Ohio.

The procedures include: recommended current ranges and arc voltages; suggestions regarding arc length, polarity of welding current, distance to hold electrode from work, cleaning beads, welding up or down, use of wide and narrow beads, peening to increase hardness, quenching, weaving the electrode, etc. Of value to all users of welding, Bulletin 401-A can be had by writing The Lincoln Electric Company, Cleveland, Ohio.

Hytempite" is a plastic, high-temperature, air-setting cement, described in a new 20 page commendably illustrated catalog from Quigley Company of New York City. It is applicable as a binder wherever fire brick, silica brick or granular refractories are used. The claims are that it retains its strength up to temperatures at which standard fire brick soften and fall. Can be used for quick (hot or cold) furnace repairs. For a copy of "Hytempite" (Catalog H. G. 501) write Quigley, Co., Inc., 56 W. 45th St., New York, N. Y.

SterElators by Everson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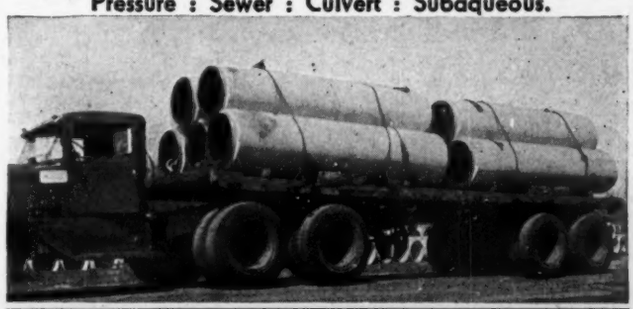

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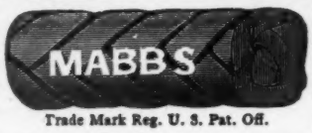

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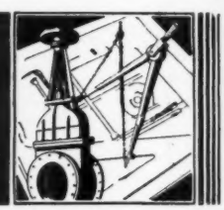

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ADVERTISERS

A

Activated Alum Corp. ... 72
Albright & Friel, Inc. ... 72
Alvord, Burdick & Howson ... 72
Arrowhead Iron Works ... 72
Atlas Mineral Products Co. of Pa. ... 68

B

Badger Meter Manufacturing Company ... 7
*Bailey Meter Co. ... 66
Black & Veatch ... 72
Burns & McDonnell Engr. Co. ... 72

C

Cast Iron Pipe Research Assoc., The ... 24-A
Chain Belt Co. ... 11
Chester Engrs., The ... 72
*Chicago Bridge & Iron Co. ... 8
Clark Controller Co., The ... 3
*Columbia Alkali Corp., The ... 9
Columbian Iron Works ... 70
Commonwealth Hotel ... 72
Crane Co. ... 12

D

Darco Corp. ... 10
Dorr Company, The ... Third Cover
Dow Chemical Company, The ... 69

E

Edson Corporation, The ... 72
Electro Rust Proofing Co. ... 67
Everson Mfg. Co. ... 71

F

Ford Meter Box Co. ... 69
Fuller & McClintock ... 72
Fulton, Edward A. ... 72

G

Gascoigne & Associates ... 72
Greeley & Hansen ... 72

H

Hill Associates, Nicholas S. ... 73

I

*Industrial Chemical Sales ... 24-D
Innis, Speiden & Company ... 68
*International Filter Co. ... 70

J

*Johns-Manville ... 4-5

K

Knowles, Inc., Morris ... 73

L

Lock Joint Pipe Co. ... 71

M

Mabbs Hydraulic Packing Co. ... 72
*Mathieson Alkali Works, Inc., The ... 6
Metcalf & Eddy ... 73
Mueller Co. ... 70

N

National Water Main Cleaning Co. ... 70
Neptune Meter Co. ... 18
Newsom, Reeves ... 73
Nussbaumer & Clarke, Inc. ... 73

P

Pirnie, Malcolm ... 73
*Pittsburgh-Des Moines Steel Co. ... 15
Pittsburgh-Equitable Meter Co. ... Front Cover
Potter, Alexander ... 73
Portland Cement Assn. ... 13

R

Riddick, Thomas M. ... 73
Roberts Filter Mfg. Co. ... 72
Roots-Connersville Blower Corp. ... 16
Russell & Axon ... 73

T

Thomson Meter Company ... 18
Turbine Sewer Machine Co. ... 71

U

*United States Pipe & Foundry Co. ... Second Cover

W

*Wallace & Tiernan Co., Inc. ... Back Cover
Water Works and Sewerage ... 24-B 24-C
Weston and Sampson ... 73
Whitman & Howard ... 73
Whitman, Requardt and Smith ... 73
*Wood Co., R. D. ... 14

*Advertisers with * were represented in the April, 1938, Convention and Data Edition with catalog specification copy. Please refer to that issue for additional information on any of their products.

HAVE YOU A FRIEND

WHO MIGHT BE INTERESTED in receiving a sample copy of WATER WORKS & SEWERAGE? Send us his name and address and we'll be glad to send him an issue free. Send as many names as you wish so long as they represent persons interested in the field covered by this magazine.

POSITION WANTED

I AM SEEKING A POSITION as an assistant construction engineer that I can obtain field and office experiences; or anything pertaining to civil engineering.
I graduated from University of Michigan, with B.S. in civil engineering. I had taken special or post-graduate courses in highway engineering, soil stabilization, structural; and attended Camp Davis, Jackson, Wyo., for practical surveying. Write B.Y.L., Water Works and Sewerage, 330 South Wells St., Chicago.

Dorrco Doings in 1938

The past year has seen a type of "progress" that many regard as retrogression. The narrow escape from what the world thought was to be the beginning of "the next war" gave everyone a jolt from which we have not yet recovered.

Whatever our beliefs may be, we must give serious thought to the point made by Anthony Eden during his recent visit to New York. Ideologies, he said, are judged by their results. Those who believe that a democracy offers the greatest satisfaction to the human soul must utilize their best endeavors to assure that democracy offers as much spiritually and materially to its adherents as the other system.

It seems incredible that there should be built up any type of hatred—racial as abroad, or of classes as in this country—as a means of bettering the condition of any section of humanity. Yet just this is taking place today. I believe, however, that the further the pendulum swings in one direction the sooner it will start back in the other.

WESTPORT

During its first full year of operation, our new Westport Mill handled 20% more jobs than in 1937 and on these expended almost 50% more time and effort. 37 different projects came from countries outside the United States. Semi-commercial scale tests resulted in one of the world's largest sewage Distributor installations at Dallas, Texas; and another series of tests in the first combination Flocculator-Clarifier installation at Ypsilanti, Mich.

WORLD'S LARGEST DESILTING PLANT

At the All-American Canal Desilting Plant near Yuma, Arizona, 72-125 ft. dia. Dorr Clarifiers, providing 28 acres of settling area, will remove daily 70,000 tons of silt from 8 billion gallons of turbid, Colorado River water, at an expenditure of less than 400 horsepower.

CLASSIFICATION

The new fine grinding plant at The Hollinger, in Ontario, consisting of four Dorr FX Classifiers in closed circuit with low discharge ball mills, is attracting wide attention and will be the subject of an A. I. M. E. paper in February.

Our 1939 model Dorr FX's have rakes with higher lifts and 15% more raking capacity.

TONNAGE

The new sand preparation plant for the Grand Coulee High Dam uses our Hydroseparators, Classifiers and Bowl Classifiers for producing a final blended sand with the fineness modulus of 2.90 set by the Federal Engineers. It is the world's largest—50,000 tons of feed per 24 hours—and the Dorr FX's are raking 1000 tons per foot of width per day.

TRADE WASTE TREATMENT

One of our ADKA White Water Savealls in a Pennsylvania paper mill is not only preventing stream pollution, but is also saving 25 to 30 dollars a day, which will repay the cost in less than a year.

Our first installation for treating steel pickling liquors is expected to yield a crystal clear solution by removing 98% of the soluble sulfates and by oxidizing 98% of the ferrous salts.

CYANIDING

The Dorr Washing Type Thickener at Cactus Mines in California gave within ½ percent of the standard C. C. D. washing efficiencies, yet saved 64% in ground area and 25% in cost.

SANITATION

At Cedar Rapids, Iowa the use of Dorrco Flocculators on raw sewage ahead of sedimentation, without the use of chemicals, has shown 50% greater removals of suspended solids.

This year we have developed a number of units combining two operating steps in a single tank for small municipalities. The Clarigester combines clarification and digestion; the Claraetor, clarification and aeration; and the Squarex Clarifier, flocculation and clarification.

SUGAR

Petree & Dorr, our cane sugar affiliates, have introduced an improved cane sugar Clarifier in which the efficiency and capacity have been improved through preflocculating the feed and an improved distribution of feed to each compartment. Thickened mud is removed from each compartment by a new method which prevents its dilution with feed to other compartments.

ABROAD

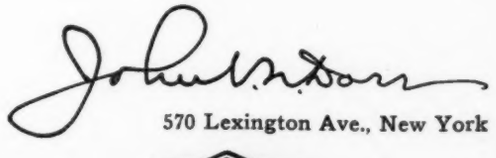
In Japan we have supplied equipment for three aluminum plants; in the Philippines, Dorr Washers for the removal of primary slime at two cyanide mills; in South Africa and Brazil, two complete sewage plants—one at Capetown and the other at Campina Grande.

Our European Associates are providing complete aluminum plant equipment in Jugoslavia and India; two complete new gold mills of the cyanide type for Bulgaria and Colombia; a complete recausticizing plant for Montecatini in Italy; a large new sewage clarifier installation for the London County Council and dewaxing filters for four lubricating oil plants in Germany.

This was a stay-at-home year for me with only one trip through the West and none abroad. Much planning and work of a fundamental nature with our European associates has been done at home, extending the responsibility of the organization as a whole.

Visitors at the Westport Mill from 13 other countries and a closer bond with Petree & Dorr, our cane sugar associates, helped to draw us more firmly together. Angola, Australia, Martinique and Reunion have been added to the areas of the world visited this year by our staff.

From everywhere, technically if not politically, comes interest and cooperation. In the name of Dorr men everywhere, I send Christmas Greetings to friends wherever situated and trust that the clear breath of the New Year will blow away the phantasies hovering around us all during 1938.



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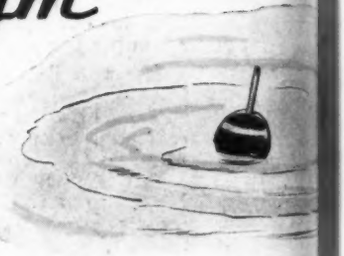
DORRCO

"You smart engineers can't fool me.. water ain't no Diaphragm"



SOMEWHERE Bill Jones has read the specifications for a W&T Visible Vacuum Chlorinator with the phrase "utilizing water as the diaphragm" and he doesn't believe in it any more than he did when he saw the giraffe at the circus and said: "There ain't no such animal!"

But, if we could coax him to take a look through the bell jar of a Visible Vacuum Chlorinator in operation, he'd have to believe that water could act as a diaphragm and the most effective one ever designed for a piece of chlorine control apparatus. For the elasticity of a water level isn't impaired by the stresses and strains of constant movement. A water-level-diaphragm doesn't wear out no matter how long it is used. With the injector suction working to raise it higher and the inflow of chlorine trying to push it down, it just stays where it belongs, doing a dependable job, and even the skeptic at the head of the page would applaud its passive resistance to any possibility of trouble or expense. You can join him in the "seeing is believing" class by writing today for technical publications describing W&T Visible Vacuum Chlorinators.

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